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Alboglossiphonia afroalpina sp. nov. and *Alboglossiphonia buniana* sp. nov. – two new leech species from Africa and revision of the genus *Alboglossiphonia* Lukin, 1976 in Africa

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Abstract

Two new leech species from Africa are presented. The position of the eyes, the number of crop caeca and the gonopores separated by two annuli indicate that both belong to the genus *Alboglossiphonia*. *Alboglossiphonia afroalpina* **sp. nov.** differs from the other African species in its elongated body shape, the shape and size of the suckers and above all by the unique spotting on the dorsal side, which is not found in any other species of the genus. *Alboglossiphonia afroalpina* **sp. nov.** inhabits the alpine zones of the Mt. Kenya and Mt. Elgon massifs and represents the highest record of a leech in Africa to date, approx 4,500 m above sea level. *Alboglossiphonia buniana* sp. nov. differs from other species of the genus by its completely fused pairs of eyes, the shape and size of the cranial sucker and the head area and a jagged outer margin. The species is only known from Bunia in northeastern Democratic Republic of Congo.

Eleven species of the genus *Alboglossiphonia* are known from Africa, belonging to different zoogeographical areas. Northwest Africa is home to *Alboglossiphonia hyalina* (O.F. Müller, 1774) and *A. iberica* Jueg, 2008 as Palaearctic species. *Alboglossiphonia polypompholyx* Oosthuizen, Hussein & El-Shimy, 1988, *A. disuqi* El-Shimy, 1990 and *A. levis* Gouda, 2010 are restricted to the lower reaches of the Nile in Egypt. Six species exist south of the Sahara: *Alboglossiphonia namaquaensis* (Augener, 1936), *A. disjuncta* (Moore, 1939), *A. conjugata* (Oosthuizen, 1978), *A. macrorhyncha* (Oosthuizen, 1978) as well as those described here, *A. afroalpina* **sp. nov.** and *A. buniana* **sp. nov.** The examination of the three syntypes of *Alboglossiphonia namaquaensis* (Augener, 1936) showed that this species is identical to *A. cheili* (Oosthuizen 1978) and that the latter must be used as a synonym in future. Historical evidence from the Central Africa Museum in Tervuren (Belgium) from the Sciacchitano Collection and the British Museum of Natural History was examined. The systematic position of *Glossiphonia verrucata* Sciacchitano, 1939 was also clarified. Almost all species were photographed for the first time, most of them including their holotype. Distribution maps are presented for all species. All African *Alboglossiphonia* species are compared in terms of their characteristics in tabular form.

Key Words

New species, Glossiphoniidae, *Alboglossiphonia afroalpina* sp. nov., *Alboglossiphonia buniana* sp. nov., *Alboglossiphonia* spp., revision, morphology, taxonomy, zoogeography, Mt. Kenya, Mt. Elgon, Bunia, Africa

Introduction

In February 2010, the malacologist Dr. Ulrich Bößneck with his wife Dr. Kathrin Bößneck (Nordhausen) and Dr. Christian Albrecht (University of Giessen) travelled to East Africa to search for small clams (Sphaeriidae) in the Afroalpine regions of the Mount Kenya massif. Numerous mountain lakes around Mt. Kenya were sampled by Dr. Ulrich Bößneck with his wife, sometimes under the most adverse weather conditions. As an attentive zoologist, he documented the accompanying fauna and secured evidence that is rare from such extreme biotopes and therefore of particular value. Among the collected Hirudinida was an animal of the genus *Alboglossiphonia*, which on closer

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inspection turned out to be a new species. Unfortunately, Dr. Ulrich Bößneck passed away on September 13, 2019, after a serious illness, and was denied the appreciation of his find. His merits outside of malacology were also recognized in his obituary (Menzel-Harloff et al. 2020) and the species described here was already announced as such. As a superlative of this find, it should be noted that it is the highest record of a leech in Africa to date (4,493 m above sea level). This leech was the reason for writing this paper. During the research for the differential diagnosis, numerous questions and inaccuracies within the genus *Alboglossiphonia* in Africa arose that had to be clarified, both taxonomic and zoogeographical. Therefore, all available sources in literature and European museum collections (Tervuren/Belgium, London, Hamburg, Frankfurt am Main) were used to update the status of this genus. The systematic positions of *Glossiphonia verrucata* Sciacchitano, 1939, *Alboglossiphonia namaquaensis* (Augener, 1936) and *Alboglossiphonia cheili* (Oosthuizen, 1978) could also be clarified.

In Africa, several high mountain ranges with Afroalpine zones, some with glacial formation, stretch along the East African Rift Valley, from the Ethiopian highlands through Kenya and Uganda to Tanzania. Little is known about the leech fauna of these high mountains. The species newly described here should serve as a basis for further investigations on the leech diversity in these areas, which would likely result in the discovery of additional new species. The alpine enclaves of the high East African mountains offer a series of geographically and ecologically isolated temperate islands populated by a species-poor flora that is particularly adapted to the extreme climate (Hedberg 1970). The fauna of these mountains is also rich in endemic and vicarious species, especially insects. Hedberg (1970) attributes the high level of endemism to the long-term isolation of the East African high mountains from each other and from other temperate regions. The high mountains have apparently been isolated from each other since their formation. Pleistocene climatic changes could not have allowed direct contact between the different alpine enclaves.

All East African high mountains, e.g., Rwenzori Mountains (Moon Mountains), Kilamandjaro Massif, and Mt. Elgon Massif, show similar ecological conditions, which will be presented here using the example of Mt. Kenya Massif. The Mount Kenya massif, located about 150 km north of Nairobi, has the second highest mountain in Africa with the Batian (5,199 m above sea level). Its central areas, which are higher than 3.200 m, are part of Mount Kenya National Park. The massif rises within the Kenyan steppe as an enclave with special ecosystems. In the west, where the clouds accumulate, there is a tropical climate with a narrow belt of rainforest. The tree line is reached at approx. 3,200 m above sea level. There follows a zone up to approx. 4,000 m above sea level, which is mainly formed by tussock grasses, cushion plants and stemless rosette plants. Above this, the vegetation becomes increasingly sparse until finally, from 4,700 m above sea level, rugged rocks with no vegetation and scree slopes and glaciers follow. There are numerous mountain lakes, streams and waterfalls throughout the massif which drain into the Indian Ocean. The climate in the Afroalpine zone is characterized by extremes, with fluctuations of 20–30 °C observed within a day.

The genus *Alboglossiphonia* Lukin, 1976, is represented worldwide with at least 25 species on all continents except Antarctica, with a diversity hotspot in Africa represented by eleven currently known species.

Generic diagnosis *Alboglossiphonia* Lukin, 1976

Flat glossiphoniid leeches with at least three pairs of eyes. The first pair is always close together and often fused. The following two pairs of eyes may be separated or compound. Salivary glands diffuse, six or seven pairs of crop caeca. Genital pores separated by 0–2 annuli. Cocoons or single eggs are attached to the venter (Haementeriinae). The feeding is liquidosomatophagous (Sawyer 1986; Nesemann and Neubert 1999).

Materials and methods

Initially, there was only one specimen of the new species *Alboglossiphonia afroalpina* sp. nov. from the locus typicus for this publication, which has been in the author's collection since 2010. As part of the research on the *Alboglossiphonia* species from Africa, especially south of the Sahara, I conducted an extensive literature review and examined collection material in various museums. In particular, the extensive collections of the Italian Iginio Sciacchitano in the Central Africa Museum Tervuren (Belgium) contained valuable evidence. All existing specimens of the genera *Alboglossiphonia* (or *Glossiphonia*) were examined and re-evaluated. Sciacchitano worked on material from various collectors and expeditions, especially from the Democratic Republic of Congo (formerly Belgian Congo), but also from South Africa, Angola, Kenya, Togo and Ethiopia. All specimens of *Alboglossiphonia* deposited by him, identified without exception as *Alboglossiphonia disjuncta*, were examined.

A total of four species were hidden among these animals, including specimens of the new species *Alboglossiphonia afroalpina* described here from Kenya and the new species *A. buniana* sp. nov. from Bunia in the Democratic Republic of Congo. Further specimens from the Sciacchitano collection were extremely important for the revision of the genus, since their taxonomy was evaluated very differently in the literature (e.g. Oosthuizen 1978b). The systematic position of *Glossiphonia verrucata* Sciacchitano, 1939, which is not identical to *Glossiphonia verrucata* (Fr. Müller, 1844), could also be clarified during this study. The holotypes of a total of five African species were examined from the Natural History Museum in London. In addition, further material from the BNHM London could be assigned to the current nomenclature. Other museums also have specimens in their collections that were included in the

revision of the genus. The Zoological Museum Hamburg holds the type material of *Alboglossiphonia namaquaensis*, which was examined for other characters not recognized or published by Augener (1936). These animals are shown for the first time. A specimen of *Alboglossiphonia disjuncta* from Syria from the Senckenberg Museum in Frankfurt/Main could be interpreted as a misidentification.

In addition to the comprehensive photographic representation of ten of the eleven known African species, complete distribution maps based on the current state of knowledge can also be presented for the first time for all species of the genus. In particular, the zoologists and photographers from the Zoological Museum of the University of Greifswald (Dr. Peter Michalik) and the Royal Museum of Central Africa in Tervuren, Belgium (Arnaud Henrard) created extensive photographic material of all known species (except *Alboglossiphonia levis*). Images from Dr. Peter Michalik (Zoologisches Museum Greifswald) were taken with the BK PLUS Lab system (Dun Inc.) using a Canon 65 mm macro lens mounted on a Canon 5D Mark II camera. Image stacks were captured with Adobe Lightroom and processed using Zerene Stacker under PMax value. Obtained extended focus images were edited using Adobe Photoshop CS 6. All measurements are given in millimeters. Digital images of the Royal Museum for Central Africa (RMCA) by Arnaud Henrard using a Leica DMC4500 digital camera mounted on the stereozoom microscope and stacked using Leica Application Suite (LAS) version 4.3.0. Photographs of the RMCA specimens are visible on the RMCA Virtual Collection website (https://virtualcol.africamuseum.be). One photo was taken by Monika Jueg (Ludwigslust) with a smartphone Huawai p 30 pro through the eyepiece of a reflected light microscope.

The following abbreviations are intended to simplify the naming of museums with more extensive material in the following text.

RMAT Royal Museum of Central Africa in Tervuren, Belgium;
ZMH Zoological Museum Hamburg, Germany;
BMNH British Museum of Natural History London, UK.

Anatomical features in the specimens examined could mostly not be described without damage to the animals. Nevertheless, clearly recognizable external features point to the current determinations, especially in the new species, which justifies their description. The holotype of *Alboglossiphonia afroalpina* sp. nov. from the Afroalpine zone of the Mt. Kenya massif (4,493 m above sea level) and 20 other animals from the Afroalpine zone of the Mt. Elgon massif (3,000 and 3,850 m above sea level) as well as the 25 animals of *A. buniana* sp. nov. from Bunia in the northeast of the Democratic Republic of Congo were examined with regard to all externally detectable parameters and compared with the known African *Alboglossiphonia* species. Photos and drawings also show typical features. For detailed descriptions of other species reference is made to the revision of the genus (see section 3.).

For the future, additional studies on the anatomy of the two newly described species are desirable, especially on fresh material. DNA sequencing is desirable for all species of the genus in order to clarify the relationships and the intraspecific range of variation of some species (e.g. *A. disjuncta*).

Results and discussion

Description of *Alboglossiphonia afroalpina* sp. nov.

Taxonomy (according to Tessler et al. 2018)

Class Clitellata Michaelsen, 1919
Subclass Hirudinea Lamarck, 1818
Order Hirudinida Siddall, Apakupakul, Burreson, Coates, Erséus, Gelder, Källersjö & Trapido-Rosenthal, 2001
Suborder Glossiphoniiformes Tessler & de Carle, 2018
Family Glossiphoniidae Vaillant, 1890
Genus *Alboglossiphonia* Lukin, 1976

***Alboglossiphonia afroalpina* Jueg, sp. nov.**
https://zoobank.org/2C90BCC7-B6FE-4A63-A1FA-58D915898940

Material. In addition to the holotype from Mt. Kenya, there were 20 specimens from the Mt. Elgon massif in Kenya, on the border with Uganda, which were collected in 1953 (Sciacchitano 1960). They turned out to belong to the species described here. In Sciacchitano (1960) these animals were named *Glossiphonia disjuncta*.

***Holotype*:** 1 specimen collected on February 20th of 2010 from Kenya, Mt. Kenya national park Nanyuki Tarn, 4,493 m above sea level, leg. Dr. Ulrich Bößneck; body length 6.0 mm, maximum width 1.6 mm; deposited at the Zoological Museum of Hamburg (Germany), Coll.-No.: ZMH P-30427 (specimen 1 in Table 1).

Additional material. 1 specimen collected December of 1953 from Kenya, Mt.-Elgon-Massif near Kitale, 3,850 m above sea level; leg. Dr. J. Bouillon (Sciacchitano 1960 as *Glossiphonia disjuncta*); deposited at the Royal Museum of Central Africa in Tervuren (Belgium), Coll.-No.: 29878 (specimen 2 in Table 1).

19 specimens collected December 11th, 1953 from Kenya, Mt.-Elgon-Massif near Kitale, east-northeast from the previous location, 3,000 m above sea level; leg. Dr. J. Bouillon (Sciacchitano 1960 as *Glossiphonia disjuncta*); deposited at the Royal Museum of Central Africa in Tervuren (Belgium), Coll.-No.: 29868–29877 (specimens 3–21 in Table 1).

Type locality. Kenya, Central Kenya Province, Naro Moru, Mt. Kenya National Park north of the Teleki Valley, Nanyuki Tarn (mountain lake) (Fig. 1), 0.15493°S, 37.29793°E, 4,493 m above sea level, February 20th, 2010, leg. Dr. Ulrich Bößneck.

Figure 1. Type locality of *Alboglossiphonia afroalpina* sp. nov., Photo: Dr. U. Bößneck (†).

Diagnosis. *Alboglossiphonia* species up to 10.5 mm long and up to 2.2 mm wide; very elongated shape for the genus; almost circular suckers with thick walls, caudal sucker small (about 1/3 of the maximum body width); ground color unknown, numerous small roundish to oblong spots dorsally and less numerous ventrally (only species of the genus with this character); smooth surface, no prominent tubercles or papillae; eye position typical of the species, but with high variability; separation of the small and poorly visible gonopores by two annuli; internal anatomy unknown.

Description. The external morphology (number and position of eyes, annulation, colouration, papillation, suckers and the position of genital pores, size) was examined for the holotype and another 20 specimens. The internal morphology was not investigated (see above).

Body form and size. The body is oblong with a length of 10.5 mm. The maximum width in the second half of the body is 2.2 mm. The body is approx. 0.6 mm wide both at the beginning of the head area and at the base of the rear suction cup. Dorsum is slightly curved, ventral flat. The approx. 0.5 mm long head area is set off by a neck furrow. The hind edge of the animal is strongly concave dorsally, so that part of the posterior sucker is exposed. In egg-carrying specimens, a ventral bell-like bulge was observed to protect the clutch, as is typical for this genus.

Annulation. 69 annuli were counted. The first six annuli are in the head area. All annuli have the same width.

Suckers and mouth. The cranial sucker is rounded to slightly crosswise: 0.48 mm in length and 0.53 mm in width (max. 0.62 mm and 0.65 mm). The edge is thickened on all sides and resembles a tire. There is a relatively large mouth opening in the center of the deep, bowl-shaped cranial sucker (Fig. 7). It is triangular, with the lower edge being slightly convex and the other two sides being slightly concave. The caudal sucker is almost circular with 0.56 mm length and 0.61 mm width (max. 0.75 and 0.85 mm). The width of the caudal sucker is on average about one third of the maximum body width. The caudal sucker is only very deep in the middle, the edges are reinforced like a ring like the cranial sucker.

Colour and pattern. In life, the basic color is probably light brown to beige, and clearly lighter on the ventral side. The spotting on the dorsal side is very characteristic, consisting of elongated to rounded spots that are only slightly darker than the basic color (Fig. 8). The animals from the Elgon Mountains have more rounded spots. There are 8–12 (up to 15) such spots on each annulus. The patches often touch the annulus in front of it, but rarely extend beyond it. Altogether they give a diffuse pattern on the whole dorsal side, beginning behind the eyes up to the posterior sucker. The head area and suction cups are free of pigment. The spots are weaker on the anterior half of the body than on the posterior half. Sometimes interrupted longitudinal rows or rows of different lengths are indicated, which have a higher concentration of spots on the sides of the body. There are also spots ventrally, but fewer and weaker, which are connected to indistinct lines at the edges.

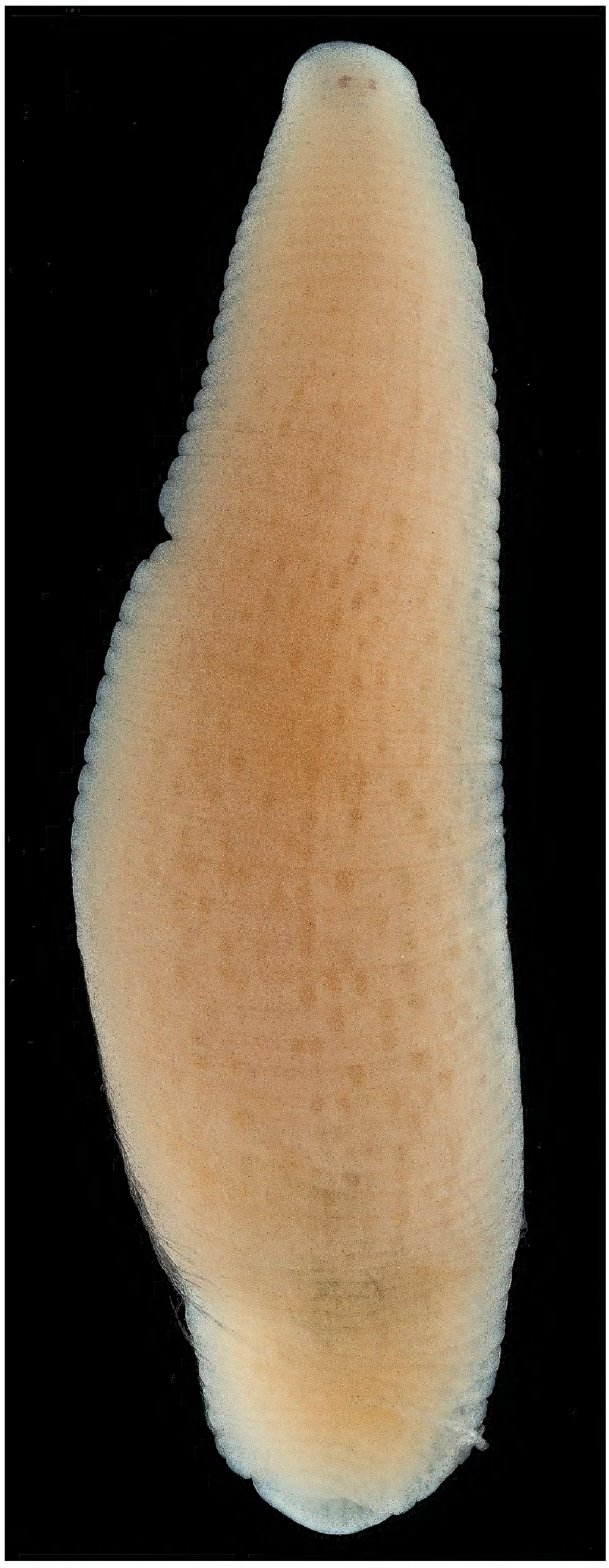

Figure 2. *Alboglossiphonia afroalpina* sp. nov., dorsal, Mt. Kenya, Holotype, length 6 mm, Photo: P. Michalik.

Papillae and tubercles. The entire body is smooth. There are no tubercles or prominent papillae. Only tiny, evenly spaced, sensory papillae are visible at high magnification. These are present on each annulus as a transverse row.

Figure 3. *Alboglossiphonia afroalpina* sp. nov., ventral, Mt. Kenya, Holotype, length 6 mm, Photo: P. Michalik.

Eyes. The eyes are typically formed for the genus *Alboglossiphonia*, with a high degree of variability in arrangement and partial reduction of the eyes (Fig. 9). However, this is not unusual for the genus (Oosthuizen 1978a, b; Jueg 2008). The first pair of eyes is at the anterior edge of the 4th annulus, the second at the posterior of the same. The third pair of eyes is on the 5th annulus. The 2nd and 3rd pair of eyes are about the same size, and the left and right eyes of each pair are very close together, and sometimes longitudinally fused. The first pair of eyes, which is significantly smaller, is much closer together. The third pair of eyes are slightly further apart than the second. Shifts in position can affect all eyes, with a strikingly high level of variability.

Gonopores. Both gonopores are very small and inconspicuous. They each lie in a furrow and are separated by two annuli. The furrows appear somewhat darker in the area of the gonopores and have the shape of a black slit (Fig. 10). The gonopores can already be seen in small animals from about 5 mm in length.

Etymology. The newly described species is named after its occurrence in the Afroalpine zone of the East African mountain massifs Mt. Kenya and Mt. Elgon.

Differential diagnosis. The affiliation to the genus *Alboglossiphonia* results from the position of the eyes and the distance between the gonopores. Eleven species are known from Africa, only six

Figure 4. *Alboglossiphonia afroalpina* sp. nov., dorsal, Mt. Elgon, RMAT Coll.-No. 29878**,** Photo: A. Henrard.

Figure 5. *Alboglossiphonia afroalpina* sp. nov., ventral, Mt. Elgon, RMAT Coll.-No. 29878**,** Photo: A. Henrard.

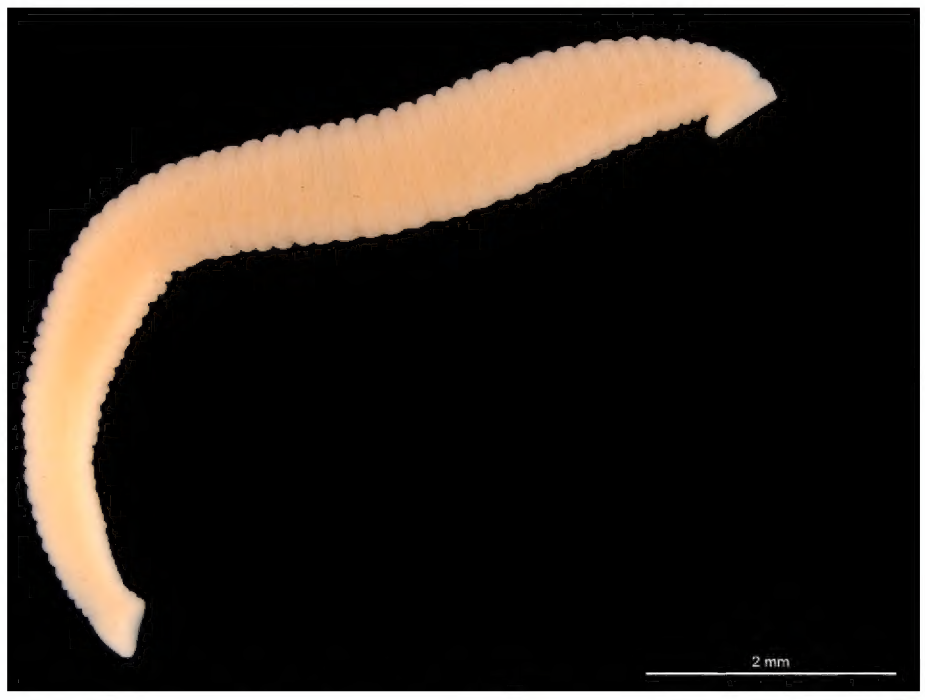

Figure 6. *Alboglossiphonia afroalpina* sp. nov., lateral, Kenia, Mt. Elgon, RMAT Coll.-No. 29868**,** Photo: A. Henrard.

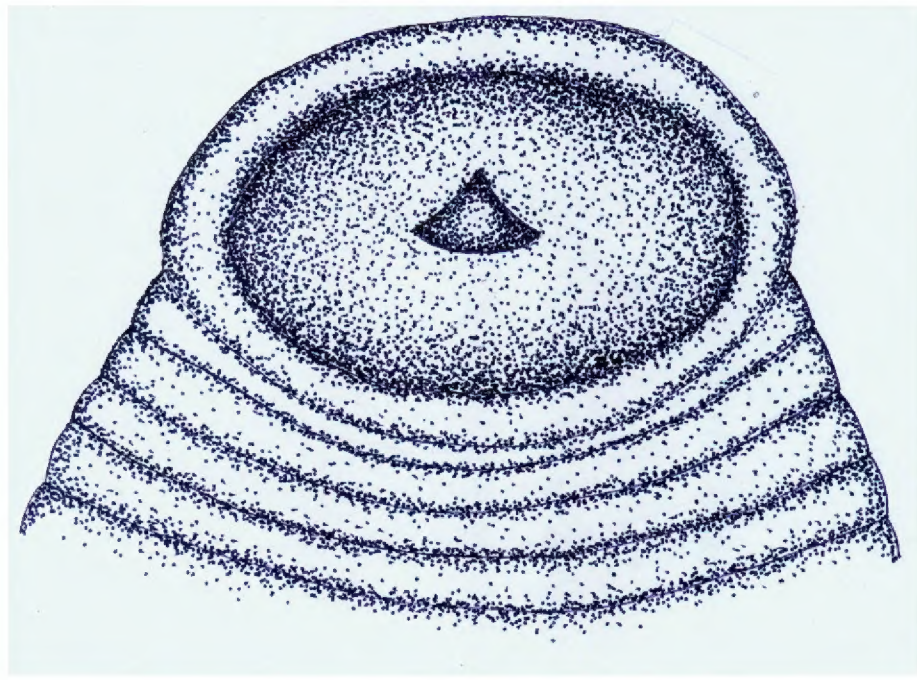

Figure 7. *Alboglossiphonia afroalpina* sp. nov., cranial sucker with mouth pore, Holotype.

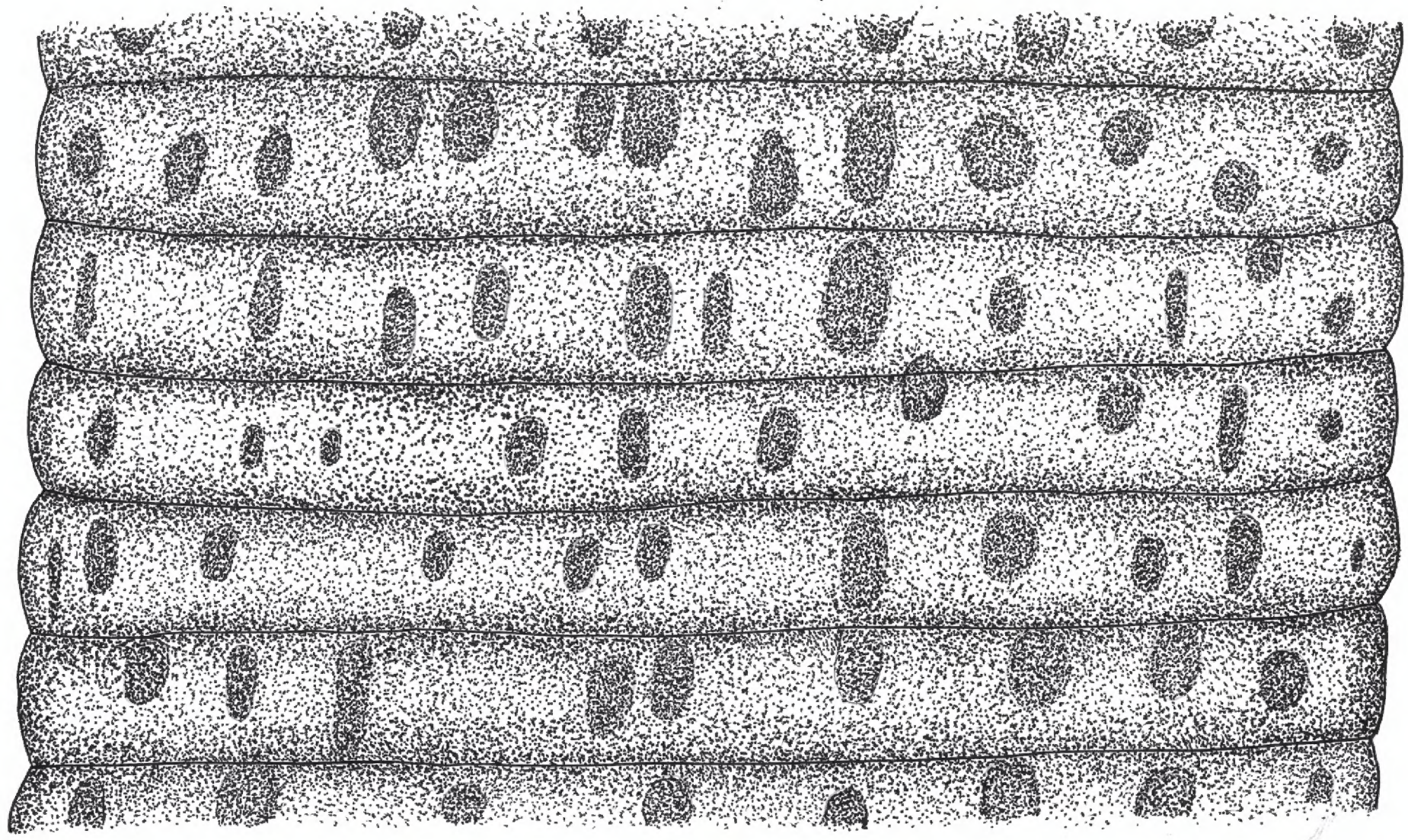

Figure 8. *Alboglossiphonia afroalpina* sp. nov., dorsal, Holotype.

of these from south of the Sahara (including this and *Alboglossiphonia buniana* sp. nov.). Internal features (e.g. the number and shape of the crop caeca) cannot be used for differentiation, but some very constant features such as the spacing of the gonopores, the shape and size of the suckers, the structure of the surface or the formation of spots and patterns distinguish among these species.

The gonopores of the species *Alboglossiphonia afroalpina* sp. nov. have a spacing of 2 annuli, differing from *A. conjugata* (Oosthuizen, 1978) and *A. disuqi* El-Shimy, 1990, where the spacing is only 1 annulus, and from *A. hyalina*, which has only one common gonopore. *Alboglossiphonia conjugata* and *A. disuqi* also have papillae and warts as well as rows of spots. The location of the gonopores of *Alboglossiphonia afroalpina* is identical with following species: *A. disjuncta* (Moore, 1939), *A. iberica* Jueg, 2008, *A. levis* Gouda, 2010, *A. macrorhyncha* (Oosthuizen, 1978), *A. namaquaensis* (Augener, 1936) and *A. polypompholyx* Oosthuizen, Hussein & El-Shimy, 1988. The presence of warts and prominent papillae clearly distinguish *Alboglossiphonia disjuncta*, *A. macrorhyncha* and *A. polypompholyx* from *A. afroalpina* sp. nov. *Alboglossiphonia afroalpina* does not have a transparent margin like that of *A. iberica* and *A. namaquaensis*. *Alboglossiphonia afroalpina* sp. nov. can be separated from all other species of the genus by its clearly elongated shape, which can only rarely

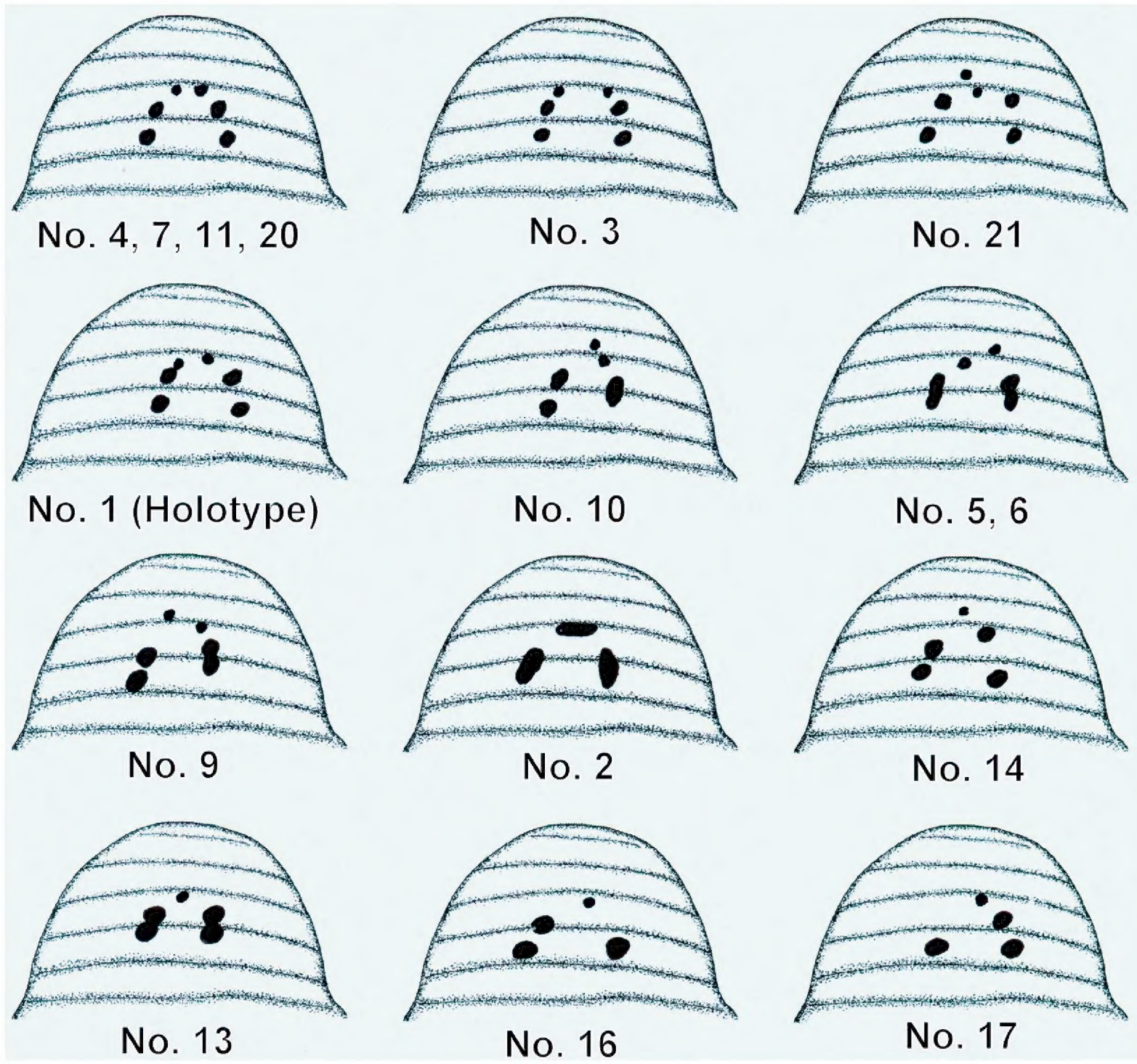

Figure 9. Eye positions of *Alboglossiphonia afroalpina* sp. nov., individual numbers correspond to Table 1.

be described as slightly oval, and by the distinctive spotting. Only *Alboglossiphonia polypompholyx* has a comparable body shape, but it is clearly covered with warts. The color pattern is unique for the genus worldwide.

The geographic and habitat distribution distinguish *Alboglossiphonia afroalpina* as a new species. The occurrence in water bodies in the alpine zone of the East African mountain massifs is unique to *A. afroalpina*.

Ecology. The mountain lake Nanyuki Tarn on Mt. Kenya (Fig. 1) has flat, stony shores, with localized boggy areas. From a depth of about 0.3 m, the sediment becomes muddy. Nevertheless, the Nanyuki Tarn has high visibility. Submerged vegetation is only sparsely developed. The accompanying fauna is just as species-poor, with only Chironomidae and *Pisidium montigenum* Kuiper, 1966 found, the latter frequently. In all of Dr. Ulrich Bößneck's collecting effort, no gastropods were found in mountain lakes above 3,000 m in the Mt. Kenya massif. *Alboglossiphonia afroalpina* sp. nov. therefore obviously feeds on insect larvae and small mussels of the genus *Pisidium*.

Nothing is known about the ecology of the specimens found in 1953 in the Mt Elgon massif, except for the sea level at which the waters (probably mountain lakes) were located. Three of the animals carried eggs, so December can be named as the period for reproduction and brood care.

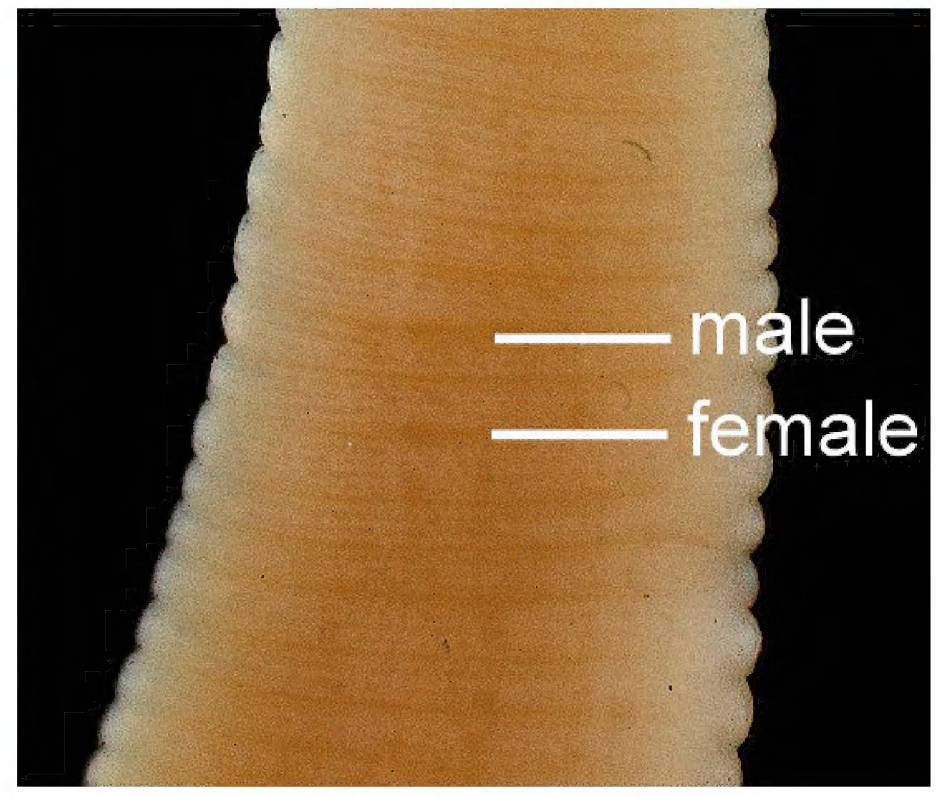

Figure 10. *Alboglossiphonia afroalpina* sp. nov., Gonopores, Holotype, Photo: P. Michalik.

Table 1. Metric characteristics of *A. afroalpina* sp. nov.; all dimensions in mm.

Specimen-No.	Length	Maximum width	Length cranial sucker	Width cranial sucker	Length caudal sucker	Width caudal sucker	Length head region	Notes
1 holotype	6.0	1.6	0.3	0.4	0.55	0.6	0.5	
2	7.5	2.6	0.45	0.5	0.75	0.75	0.38	
3	10.50	2.10	0.62	0.55	0.62	0.75	0.45	
4	10.50	2.00	0.52	0.60	0.45	0.60	0.40	
5	10.40	1.80	0.38	0.60	0.62	0.62	0.55	
6	9.70	1.35	0.55	0.55	0.55	0.60	0.50	
7	9.50	1.40	0.50	0.53	0.50	0.60	0.50	
8	9.20	1.20	0.35	0.48	0.48	0.50	0.50	Eye position not visible
9	9.10	0.90	0.50	0.50	0.42	0.42	0.48	
10	9.00	1.80	0.50	0.63	0.60	0.70	0.45	
11	8.30	2.20	0.50	0.65	0.75	0.80	0.50	
12	8.20	1.40	0.50	0.50	0.60	0.65	0.38	Eye position not visible
13	8.00	1.25	0.38	0.43	0.38	0.40	0.38	
14	6.00	1.90	0.53	0.55	0.55	0.60	?	head not removed
15	5.70	1.30	0.60	0.65	0.75	0.75	0.40	Eye position not visible; ventral glockenförmig (eggs)
16	5.60	1.65	0.48	0.55	0.50	0.50	0.32	
17	5.30	?	0.45	0.50	0.43	0.45	0.40	atypically contracted
18	5.30	1.30	0.53	0.53	0.50	0.50	0.38	Eye position not visible; ventral glockenförmig (eggs)
19	5.20	1.38	0.40	0.45	0.55	0.57	0.28	Eye position not visible
20	4.80	1.00	0.50	0.40	0.65	0.85	0.40	ventrally bell-shaped (> 20 eggs)
21	4.60	1.50	0.30	0.40	0.40	0.50	0.35	
Maximum	10.50	2.20	0.62	0.65	0.75	0.85	0.55	
Minimum	4.60	0.90	0.30	0.40	0.38	0.40	0.55	
Median	7.54	1.58	0.48	0.53	0.56	0.61	0.43	

Figure 11. Distribution of *Alboglossiphonia afroalpina* sp. nov.

Distribution. So far, the species is only known from the mountain massifs of Mt. Kenya and Mt. Elgon in Kenya. It is very likely that *A. afroalpina* sp. nov. is widespread in these massifs, and it could also be distributed on other high mountains in East Africa. A targeted search in mountain lakes in the East African high mountains would be desirable to expand the description provided here. Whether *A. afroalpina* also occurs in the lowland areas between these mountain massifs is questionable.

Description of *Alboglossiphonia buniana* sp. nov.

Taxonomy (according to Tessler et al. 2018)

Class Clitellata Michaelsen, 1919
Subclass Hirudinea Lamarck, 1818
Order Hirudinida Siddall, Apakupakul, Burreson, Coates, Erséus, Gelder, Källersjö &Trapido-Rosenthal, 2001
Suborder Glossiphoniiformes Tessler & de Carle, 2018
Family Glossiphoniidae Vaillant, 1890
Genus *Alboglossiphonia* Lukin, 1976

***Alboglossiphonia buniana* Jueg, sp. nov.**
https://zoobank.org/B2EA40CC-4414-40F5-8E41-41697A12D043

Material. A total of 25 specimens from two localities in Bunia in the Democratic Republic of Congo were examined, and are deposited in the Royal Museum of Central Africa in Tervuren (Belgium). They were labeled *Glossiphonia disjuncta* Moore, 1939.

***Holotype*:** 1 specimen, Democratic Republic of Congo, Ituri Province, Bunia, near the border with Uganda at Lake Albert, Jardin de Pères, leg. Courtois et Dr. Masse, 02.03.1952 (in Sciacchitano 1952 as *Glossiphonia disjuncta* Moore, 1939), on *Lymnaea natalensis succinoides* et *Biomphalaria ruppellii* (= *Radix natalensis* (Krauss, 1848) and *Biomphalaria pfeifferi* (Kraus, 1848)); deposited at the Royal Museum of Central Africa in Tervuren (Belgium), Coll.-No.: RMCA_VERMES_43662 (specimen 1 in Table 2).

Figure 12. *Alboglossiphonia buniana* sp. nov., dorsal, Holotype, Coll.-No. RMCA_VERMES_43662, Photo: A. Henrard.

***Paratypes*:** 19 specimens with the same locality as the holotype.

Paratype 1: RMCA_VERMES_43663 (specimen 2 in Table 2)
Paratype 2: RMCA_VERMES_43664 (specimen 3 in Table 2)
Paratype 3: RMCA_VERMES_43665 (specimen 4 in Table 2)
Paratype 4: RMCA_VERMES_43666 (specimen 5 in Table 2)
Paratype 5: RMCA_VERMES_43667 (specimen 6 in Table 2)
Paratype 6: RMCA_VERMES_43668 (specimen 7 in Table 2)
Paratype 7: RMCA_VERMES_43669 (specimen 8 in Table 2)
Paratype 8: RMCA_VERMES_43670 (specimen 9 in Table 2)
Paratype 9: RMCA_VERMES_43671 (specimen 10 in Table 2)
Paratype 10: RMCA_VERMES_43672 (specimen 11 in Table 2)
Paratype 11: RMCA_VERMES_43673 (specimen 12 in Table 2)
Paratype 12: RMCA_VERMES_43674 (specimen 13 in Table 2)
Paratype 13: RMCA_VERMES_43675 (specimen 14 in Table 2)
Paratype 14: RMCA_VERMES_43676 (specimen 15 in Table 2)
Paratype 15: RMCA_VERMES_43677 (specimen 16 in Table 2)
Paratype 16: RMCA_VERMES_43678 (specimen 17 in Table 2)
Paratype 17: RMCA_VERMES_43679 (specimen 18 in Table 2)
Paratype 18: RMCA_VERMES_43680 (specimen 19 in Table 2)
Paratype 19: RMCA_VERMES_43681 (specimen 20 in Table 2)

Additional material. 5 specimens; Democratic Republic of Congo, Ituri Province, Bunia, with *Biomphalaria adowensis* (= *Biomphalaria pfeifferi* (Kraus, 1848)), leg. Courtois et Dr. Masse, 1952 (in Scacchitano 1952 as *Glossiphonia disjuncta* Moore, 1939); deposited at the Royal Museum of Central Africa in Tervuren (Belgium), Coll. No.: 28950–28954

Type locality. Democratic Republic of Congo, Ituri Province, Bunia, Jardin de Pères, near the border with Uganda at Lake Albert, leg. Courtois et Dr. Mass, 2nd March 1952 (in Sciacchitano 1952, 1954 as *Glossiphonia disjuncta* Moore, 1939)

Diagnosis. *Alboglossiphonia* species up to 7.1 mm long and up to 3.1 mm wide; elongate oval with a strongly wavy to jagged body edge, outermost area hyaline; Head barely set off, but with a pronounced upper lip; cranial sucker small in front, round at the rear, channel-shaped towards the front (pear shaped), small pinprick-shaped mouth pore; flat caudal sucker small-medium, circular with thick walls and wide attachment point (< 1/3 of the

Figure 13. *Alboglossiphonia buniana* sp. nov., ventral, Holotype, Coll.-No. RMCA_VERMES_43662, Photo: A. Henrard.

maximum body width); Base color unknown, definitely light; 30–36 thin longitudinal stripes (muscle strands); smooth surface, no prominent tubercles or papillae, but small sensory papillae, especially lateral; eye position typical of the genre, but with constant fusion of the first pair of eyes and the left and right eyes of the second and third pair, thus only three eyes visible; barely discernible gonopores spaced by two annuli; crop caeca 6, the first 5 simple to slightly bifurcated, 6th pair with 5 small side lobes; further internal anatomy unknown.

Description. A total of 25 specimens were examined, of which all external characteristics were recorded. Regarding the internal anatomy, the crop caeca could only be examined in backlight.

Body form and size. The body is oblong oval with a length of 7.1 mm. The maximum width in the second half of the body is 3.1 mm. The dorsal side is slightly curved, the ventral side is flat. The head is only vaguely separated, the body tapers towards the tip of the body. There is a mouth lobe on the head, often visible as a narrow extension dorsally, similar to *Alboglossiphonia heteroclita* (Linnaeus, 1761). The rear edge is bluntly rounded. The side edges, which are wavy to jagged, are striking and typical of the species (Fig. 14).

Annulation. Circa 70 annuli were counted. The first six annuli are in the head area. All annuli have the same width value. In the area of the midbody, the three annuli per segment are clearly visible on the outer edge because they are separated by a deeper marginal furrow.

Suckers and mouth. The cranial sucker is small and pear-shaped (Figs 15, 16) with a maximum width and length of 2.1 mm. However, only the rear part is slightly wider. The cranial sucker merges into a rather narrow furrow that runs on the underside of the mouth flap. The edge is thin. In the center of the flat cranial sucker is a small, pinprick-shaped but clear mouth opening. The caudal sucker is almost circular with a length of 0.59 mm and a width of 0.60 mm (max. 0.95 and 0.95 mm). The width of the caudal sucker is on average less than one third of the maximum body width. The caudal sucker, which is ventrally oriented and has a wide base, is flat with strong edges.

Colour and pattern The living animal is certain to have a light base color, probably light brown or yellowish. The ventral side is lighter. There are no spots or patterns. There are 30 to 36 thin stripes (muscle strands) recognizable as faint longitudinal lines, especially in the middle and rear part. The outer edge is a hyaline area that is more or less pronounced (Fig. 17).

Papillae and tubercles. The entire body is smooth. There are no warts or prominent papillae. Only tiny, evenly spaced, sensory papillae are visible at high magnification. At the margins, these papillae appear to be more concentrated where the hyaline outer lobes protrude.

Eyes. At first glance, the consistently three eyes are not typically formed for the genus *Alboglossiphonia*. In three of the 25 specimens available, it was evident that two eyes had fused together. These almost always result in circular structures. The original six eyes and their arrangement are therefore typical of the genus. The eyes do not differ in size. The first, medially fused, pair lies on annulus 4 and the longitudinally fused left and right eyes of the second and third pairs are found on annulus 5. As with all *Alboglossiphonia* species, there are variations in the arrangement (Fig. 18). Eye reductions are not recognizable.

Figure 14. *Alboglossiphonia buniana* sp. nov., habitus with jagged body edge and visible crop caeca, Paratype 16, Coll.-Nr. RMCA_VERMES_43677, Photo: M. Jueg.

Sciacchitano (1954) already pointed out the merging of the eyes (specimens No. 21–25), so that only three eyes can be seen instead of six (three pairs) of eyes. One specimen is even said to have a complete fusion of all six eyes, but this could not be confirmed in the present revision. Some specimens were curled and severely hardened so that the eyes were not visible.

Gonopores Both gonopores are very small and inconspicuous to almost invisible. Gonopores can only be seen in five specimens from a body length of 5.9 mm, mostly only very faintly. The distance between the male and female gonopore is two annuli. Sometimes the furrow between them also appears somewhat darker, giving the appearance of three gonopores. However, this remains unconfirmed.

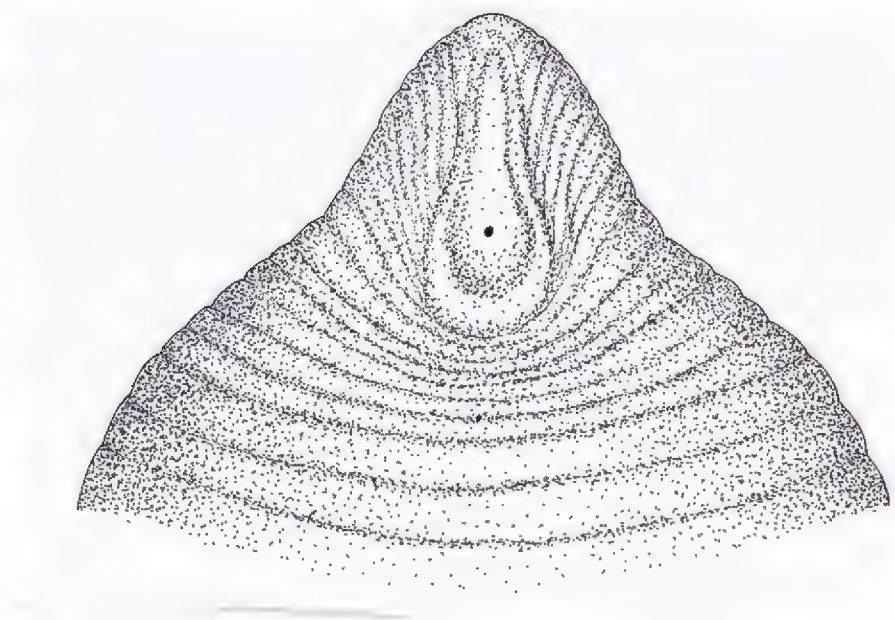

Figure 15. *Alboglossiphonia buniana* sp. nov., cranial sucker with mouth pore.

Crop caeca. Crop caeca are only visible in a few animals (Fig. 14). There are 6 pairs of crop caeca. The first 5 are simple, of which the back ones often split in two in the last third. The edges appear wavy. The 6th pair of ventricles has 5 small side branches, which also have wavy borders.

Etymology. The newly described species is named after the place where it was found. Bunia is the capital of Ituri Province in the Democratic Republic of the Congo.

Differential diagnosis. The placement in the genus *Alboglossiphonia* results from the position of the eyes and the distance between the gonopores. Eleven species are known from Africa, and only six from south of the Sahara (including this one). All characteristics from Table 2 can be used for differentiation.

The gonopores of the species *Alboglossiphonia buniana* sp. nov. have a distance of 2 annuli, differing from *A. conjugata* (Oosthuizen, 1978) and *A. disuqi* El-Shimy, 1990, where the distance is only 1 annulus, and from *A. hyalina*, which has only one common gonopore. *Alboglossiphonia conjugata* and *A. disuqi* also have papillae and warts as well as rows of spots. The location of the gonopores is identical in the following species: *Alboglossiphonia afroalpina* sp. nov., *A. disjuncta* (Moore, 1939), *A. iberica* Jueg, 2008, *A. levis* Gouda, 2010, *A. macrorhyncha* (Oosthuizen, 1978), *A. namaquaensis* (Augener, 1936) and *A. polypompholyx* Oosthuizen, Hussein & El-Shimy, 1988. The presence of warts and prominent papillae clearly distinguish *Alboglossiphonia disjuncta*, *A. macrorhyncha* and *A. polypompholyx* from *A. buniana* sp. nov. An important diagnostic feature is the crop caeca, of which there are 6 pairs. Only *Alboglossiphonia macrorhyncha*, *A. hyalina* and *A. disuqi* have the same number. These species differ in the distances between the gonopores (see above). The number of crop caeca in *Alboglossiphonia afroalpina* is not known. However, this species clearly differs from all others in its distinctive spotting and body shape. *Alboglossiphonia macrorhyncha* is most similar to *A. buniana sp. nov.*, however, the latter differs in the shape of the anterior sucker with mouth opening, the smooth body surface and especially the wavy to jagged hyaline outer edge. The pairs of eyes fused into three eyes with a round cross-section seem to be typical of

Figure 16. *Alboglossiphonia buniana* sp. nov., cranial sucker, Holotype, RMCA_VERMES_43662, Photo: A. Henrard.

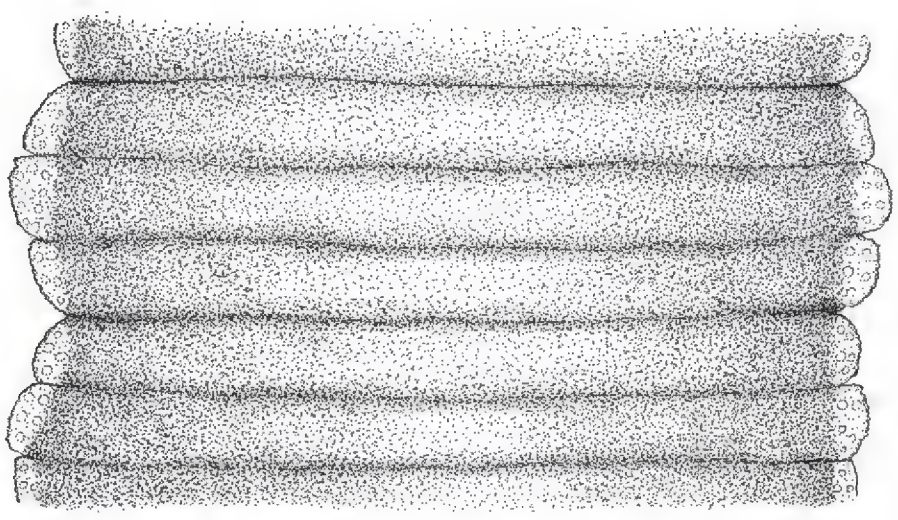

Figure 17. *Alboglossiphonia buniana* sp. nov., dorsal.

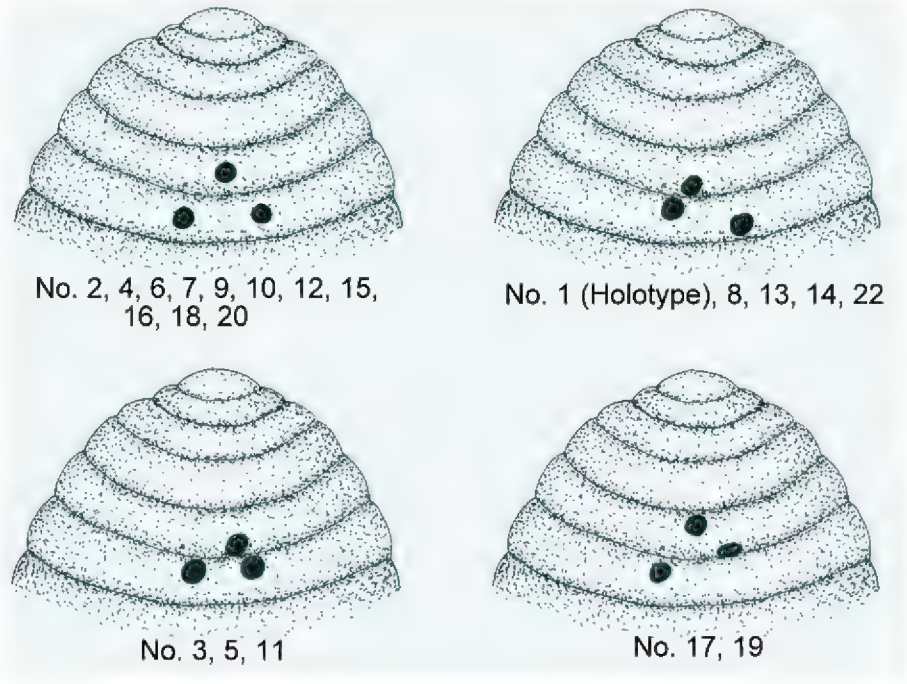

Figure 18. Eye positions of *Alboglossiphonia buniana* sp. nov., individual numbering corresponds to Table 2.

Alboglossiphonia buniana. Fusions to form three eyes also occur regularly in *Alboglossiphonia polypompholyx* and *A. levis*, but not in a circle but rather as clusters of pigment (Oosthuizen et al. 1988; El-Shimy 1994; Gouda 2010). However, the position of the eyes can also be variable.

Ecology. Not much can be said about the ecology because no information other than the host animals was recorded when the specimens were collected in 1952. *Alboglossiphonia buniana* has been found feeding on *Biomphalaria pfeifferi* and *Radix natalensis*. Both snail species are widespread in Africa in standing and slow-flowing waters. *Radix natalensis* prefers flat riparian areas with different substrates (e.g. submerged vegetation, rocks, mud).

Distribution. *Alboglossiphonia buniana* sp. nov. is only known from Bunia, the capital of Ituri Province in the Democratic Republic of Congo. On the labels of the two tubes in the Central Africa Museum in Tervuren (Belgium) and in Sciacchitano (1952, 1954) there are no more detailed place names, except for Jardin de Pères ('Garden

Table 2. Metric characteristics of *A. buniana* sp. nov.; all measurements given in mm.

Specimen-No.	Length	Maximum width	Length cranial sucker	Width cranial sucker	Length caudal sucker	Width caudal sucker	Length head region	Notes
1 holotype	7.10	3.00	0.25	0.40	0.95	0.95	1.60	gonopores visible
2 paratype	6.70	2.55	0.25	0.15	0.75	0.75	1.38	gonopores visible
3 paratype	6.50	3.15	0.25	0.25	0.75	0.83	1.40	gonopores visible
4 paratype	6.10	2.30	0.20	0.15	0.70	0.65	0.75	
5 paratype	6.50	2.15	0.25	0.35	0.65	0.70	1.38	Gonopores faintly visible
6 paratype	5.90	2.25	0.30	0.30	0.70	0.68	1.00	torn in the front part, Gonopores faintly visible
7 paratype	5.80	2.20	0.18	0.20	0.60	0.65	1.00	
8 paratype	5.20	2.20	0.20	0.15	0.50	0.55	0.85	
9 paratype	5.20	2.10	0.25	0.25	0.65	0.75	1.13	
10 paratype	5.10	2.63	0.28	0.25	0.75	0.75	0.95	Eyes clearly visible
11 paratype	5.10	2.00	0.23	0.15	0.60	0.58	0.95	Crop caeca visible
12 paratype	5.00	2.75	0.20	0.20	0.63	0.65	1.20	
13 paratype	5.00	2.50	0.20	0.15	0.62	0.65	1.30	
14 paratype	4.50	2.05	0.25	0.20	0.50	0.50	0.85	
15 paratype	4.13	1.75	0.20	0.15	0.40	0.48	0.68	
16 paratype	4.75	1.90	0.18	0.15	0.50	0.50	0.75	Crop caeca clearly visible against the light from anterior
17 paratype	4.70	1.95	0.20	0.18	0.50	0.50	0.85	Crop caeca visible
18 paratype	4.60	2.65	?	?	0.50	0.55	0.65	front end turned over
19 paratype	4.30	1.75	0.20	0.20	0.45	0.38	0.85	Crop caeca visible
20 paratype	4.10	1.50	0.15	0.18	0.38	0.45	0.60	
21	4.60	2.80	0.25	0.30	0.62	0.50	?	Max. width in front of the middle, eyes not visible
22	4.45	1.60	0.25	0.25	0.50	0.50	?	strong upper lip
23	3–4	1.40	0.15	0.15	0.48	0.40	?	rolled up, eyes not visible
24	3–4	1.15	0.10	0.10	0.38	0.35	?	rolled up, eyes not visible
25	3–4	0.95	0.10	0.10	0.48	0.48	?	rolled up, eyes not visible
Max	7.10	3.15	0.30	0.40	0.95	0.95	1.60	
Min	4.10	0.95	0.10	0.10	0.38	0.35	0.60	
Median	5.32	2.17	0.21	0.21	0.59	0.60	1.03	

Figure 19. Distribution of *Alboglossiphonia buniana* sp. nov.

of the Fathers'; Sciacchitano 1952). It could be the park at a church or school (oral communication C. Allard, Tervuren). Bunia is located at about 1,250 m above sea level on the edge of the Blue Mountains (with elevations of up to 2,000 m above sea level) immediately west of Lake Albert on the border with Uganda. Several small rivers flow through Bunia, emptying into the Aruwimi, which in turn drains into the Congo.

Revision of the genus *Alboglossiphonia* Lukin, 1976 in Africa

With the species newly described here, eleven representatives of the genus *Alboglossiphonia* Lukin, 1976 are known from Africa, which belong to different zoogeographical regions. Two species of the Palaearctic fauna (*A. hyalina* and *A. iberica*) are known from Northwest Africa (Ben Ahmed et al. 2008, 2015a, b; Mabrouki et al. 2019). A second, zoogeographically isolated group of *Alboglossiphonia* species in Africa consists of three species in the lower reaches of the Nile (Egypt only): *A. polypompholyx*, *A. disuqi* and *A. levis* (Oosthuizen et al. 1988; El-Shimy 1990a, b; Gouda 2010). Possibly the range of *Alboglossiphonia polypompholyx* extends upstream to Ethiopia. Only about 60 reliable Hirudinida species are known from the Afrotropical zone of Ethiopia proper (sub-Saharan Africa), including six *Alboglossiphonia* species (*A. disjuncta*, *A. namaquaensis*, *A. conjugata*, *A. macrorhyncha*, *A. afroalpina* and *A. buniana*). In Sawyer (1986) only 42 leech species are known for the Afrotropical region. This makes Africa (excluding North Africa and Madagascar) the continent with the fewest species and the most poorly studied continent.

The eastern Palaearctic *A. weberi* (Blanchard, 1897), occasionally mentioned for Africa in the literature (e.g. Moore 1933; Autrum 1936; El-Shiemy 1990b; Ben Ahmed 2015b), turned out to be confused with *Alboglossiphonia disjuncta* (e.g. Moore 1939; Sciacchitano 1952) and

A. disuqi. Likewise, *Alboglossiphonia heteroclita* (Linnaeus, 1761) given by Harding (1932) for Ethiopia was assigned to *A. disjuncta* in later works (e.g. Sciacchitano 1965, 1967), although the characters mentioned are "amber-colored, without dark spots and six eyes typically arranged as a triangle" hardly allow an exact species determination. El-Shiemy (1990b) also lists *A. conjugata*, which was probably confused with specimens of *A. levis* described later.

According to the distances between the gonopores, three groups can be distinguished worldwide within the genus *Alboglossiphonia*, which also mainly correlate zoogeographically.

1. Two gonopores separated by 2 annuli:
   Nine species belong to this group, of which only one species is found exclusively outside of Africa. This means that this trait is an original and almost unique trait of African species.
   A. afroalpina Jueg, 2022: Afrika (Kenya),
   A. annandalei Oka, 1922: India, Myanmar,
   A. buniana Jueg, 2022: Africa (Democratic Republic of the Congo),
   A. disjuncta (Moore, 1939): Africa (southern of the Sahara)
   A. iberica Jueg, 2008: Africa (Morocco), Iberian Peninsula,
   A. levis Gouda, 2010: Africa (Egypt),
   A. macrorhyncha (Oosthuizen, 1978): Africa (South Africa),
   A. namaquaensis (Augener, 1936): Africa (south of the Sahara),
   A. polypompholyx Oosthuizen, Hussein & El-Shimy, 1988: Africa (Egypt, Ethiopia?)

2. Two gonopores separated by 1 annulus:
   Seven species can be classified in this group, their distribution areas are limited to Africa and Australia. Only the sole *Alboglossiphonia* species in South America (*A. mesembrina*) breaks this rule.
   A. australis (Goddard, 1908): Australia,
   A. conjugata (Oosthuizen, 1978): Africa (Namibia, South Africa),
   A. disuqi El-Shimy, 1990: Africa (Egypt),
   A. intermedia (Goddard, 1909): Australia,
   A. mesembrina (Ringuelet, 1949): South America,
   A. multistriata (Mason, 1974): Australia,
   A. novaecaledoniae (Johansson, 1918): New Caledonia,

3. One gonopore, common opening:
   Nine species comprise this group. All species of the Holarctic (North America, Europe, Asia except Orientalis) belong here. The range of this group extends further into the area south of the Himalayas and even as far as Australia.
   A. heteroclita (Linnaeus, 1761): Holarctic, India (southern Himalayas)
   A. hyalina (O.F. Müller, 1774): Palearctic, India (southern Himalayas)
   A. kashiensis Nesemann, 2007: India (Ganges)
   A. lata (Oka, 1910): Eastern Palaearctic, Southeast Asia, Pacific
   A. masoni (Mason, 1974): Australia
   A. pahariensis Nesemann & Sharma, 2007: India (Ganges)
   A. striata (Apáthy, 1888): West Palaearctic
   A. tasmaniensis (Ingram, 1957): Australia
   A. weberi (Blanchard, 1897): Eastern Palaearctic, India, Southeast Asia

Key for the genus *Alboglossiphonia* Lukin, 1976 in Africa

1	Male and female gonopores united in one opening (basic color amber, only in NW-Africa)	*A. hyalina* (O.F. Müller, 1774)
–	Male and female gonopores separated by 1 or 2 annuli	2
2	Male and female gonopores separated by 1 annuli	3
–	Male and female gonopores separated by 2 annuli	4
3	Crop caeca 6 (only in the Nile Delta)	*A. disuqi* El-Shimy, 1990
–	Crop caeca 7	*A. conjugata* (Oosthuizen, 1978)
4	Body surface smooth, at most roughened by sensory papillae	5
–	Body surface with distinct papillae or warts, usually arranged in distinct rows	9
5	Dorsally with distinct round to longitudinal oval spots on the annuli (Elongated body shape, only in the high mountains of Central Africa)	*A. afroalpina* sp. nov.
–	Dorsally unicolor or with faint longitudinal stripes (muscle strands)	6
6	Cranial sucker conspicuously pear-shaped (Edge of body strongly jagged, eyes fused (only 3 eyes visible), crop caeca 6, so far only in Central Africa)	*A. buniana* sp. nov.
–	Cranial sucker shaped differently	7
7	Mouth above center of cranial sucker (Basic color very variable (yellow, beige, blue, green, side edges hyaline, crop caeca 7, 200–400 eggs, in springs and spring streams, only Atlas Mountains)	*A. iberica* Jueg, 2008
–	Mouth in the center of cranial sucker	8
8	Dorsally irregular pattern of dark green chromatophores (Crop caeca 7, only in the lower reaches of the Nile)	*A. levis* Gouda, 2010
–	Dorsally monochrome, faint longitudinal striations, lateral margins unpigmented (Crop caeca 7, widespread)	*A. namaquaensis* (Augener, 1936)

9 Papillae irregularly arranged, body oblong (Brown ground color (dark even when fixed), crop caeca 7, only in the Nile). ..... *A. polypompholyx* Oosthuizen, Hussein & El-Shimy, 1988

– Papillae arranged in (distinct) longitudinal rows 10

10 Proboscis almost as long as body, crop caeca 6, head not detached (Mouth with a conspicuous transverse slit, only found in a small area in South Africa) ..... *A. macrorhyncha* (Oosthuizen, 1978)

– Proboscis distinctly shorter than the body, crop caeca 7, head distinctly detached (Papillation very variable (possibly aggregated), almost throughout sub-Saharan Africa) ..... *A. disjuncta* (Moore, 1939)

Figure 20. *Alboglossiphonia hyalina*, Germany, North Rhine-Westphalia, Photo: F. & B. Eiseler.

Figure 21. Distribution of *Alboglossiphonia hyalina* in Africa.

Alboglossiphonia hyalina (O. F. Müller, 1774)

Synonym: *Glossiphonia heteroclita* (Linnaeus, 1761) partim

The distribution area of *Alboglossiphonia hyalina* extends over the entire Palaearctic and also reaches Tunisia and Morocco via Italy. From Tunisia, two records are known from reservoirs on the Cape Bon peninsula (Nabeul governorate) southeast of Tunis: Lebna reservoir (Ben Ahmed et al. 2008, 2015b) and Port Prince reservoir near Korbus (leg. & det. U. Jueg, October 31, 2010; Ben Ahmed et al. 2015b). Four locality records exist for Morocco, all of which are in the Atlas Mountains (Ben Ahmed et al. 2015b; Mabrouki et al. 2019). A historical statement from 1914, whose indeterminate voucher was deposited in the museum in Paris, could be revised as *Alboglossiphonia hyalina* (Ben Ahmed et al. 2015b). This work also mentions the first recent evidence: an outflow of the Ghazi spring at the village of Safrou in the Aggar river basin, about 80 km north of Fes. Two new records reported in Mabrouki et al. (2019) refer to the upper reaches of the Moulouya and Berkine rivers in the Middle Atlas near Fes.

Earlier mentions of *Alboglossiphonia heteroclita* (Linnaeus, 1761) cannot be considered here, since it could be either *A. hyalina* or *A. iberica* (e.g. Nesemann and Neubert 1999).

Alboglossiphonia iberica Jueg, 2008

Another Palearctic species that appears to be restricted to the south of the Iberian Peninsula (here the only species of the genus) and the Atlas Mountains is *A. iberica*. This species is dependent on springs and spring streams with oxygen-rich, cold water. In Ben Ahmed et al. (2015b) the first record for Africa was published. *Alboglossiphonia iberica* was found in 2009 in an artificial drainage of the Ain Soltane spring near the village of Imouzer-Kandar, 50 km from Fez. The site is at an altitude of 1,358 m above sea level. *Alboglossiphonia iberica* bears more similarities to the African than to the European species of the genus. In Mabrouki et al. (2019) only this record was cited. Apparently, *Alboglossiphonia iberica* is rare in Morocco, but can probably be found in suitable biotopes throughout the Atlas Mountains.

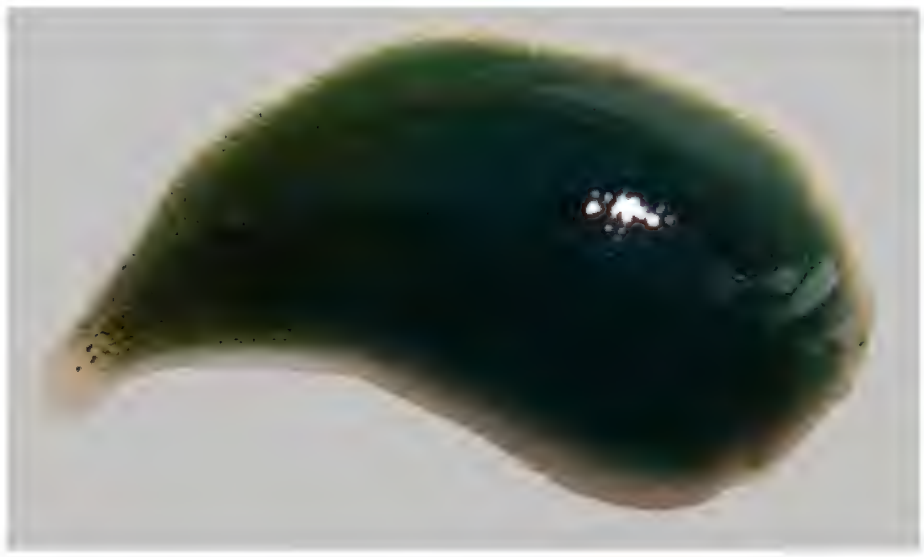

Figure 22. *Alboglossiphonia iberica*, dorsally with spermatophores, Spain, Andalusia, Huelva province, Photo: U. Jueg.

Figure 23. *Alboglossiphonia iberica*, ventrally with eggs and juveniles, Spain, Andalusia, province of Huelva, Photo: U. Jueg.

Figure 24. Distribution of *Alboglossiphonia iberica* in Africa.

Alboglossiphonia polypompholyx Oosthuizen, Hussein & El-Shimy, 1988

The species *Alboglossiphonia polypompholyx* is the most widespread of the Egyptian species of the genus (Oosthuizen et al. 1988; El-Shimy 1994). El-Shimy and Davis (1991) give twelve localities between Luxor and the Nile Delta. They often found the species on hard substrates and on leaves of the water hyacinth *Eichhornia crassipes* in the company of *Batracobdelloides tricarinata*, *Helobdella conifera* and *Barbronia assiuti* (El-Shimy and Davis 1991). Apparently, *Alboglossiphonia polypompholyx* spends most of its life in the mantle cavity of *Bulinus truncatus* and is only found outside for reproduction (El-Shimy and Davis 1991).

One specimen labeled *Glossiphonia disjuncta* Moore, 1939, paratype is stored in the Natural History Museum London under the coll. no. BMNH 1933.1.19.16-18 (Figs 26, 27). The animal was collected by J. Omer-Cooper on October 5th, 1926, in Wouramboulchi, Ethiopia (Harding 1932; Moore, 1939; Sciacchitano 1952, 1967). The animal shows many similarities with *Alboglossiphonia polypompholyx* (coloration, body shape, papillae). It seems quite possible that the Nile is also populated above Egypt and that Sudan and Ethiopia could be part of the distribution area.

Alboglossiphonia disuqi El-Shimy, 1990

Alboglossiphonia disuqi was only found in two places in the Nile Delta (El-Shimy 1990a, 1994). The first locality is on the west bank of the Nile (western main branch) near the town of Disuq, where the water hyacinth *Eichhornia crassipes* and the leeches *Batracobdelloides tricarinata*, *Helobdella conifera* and *Barbronia assiuti* were commonly found. The second location (locus

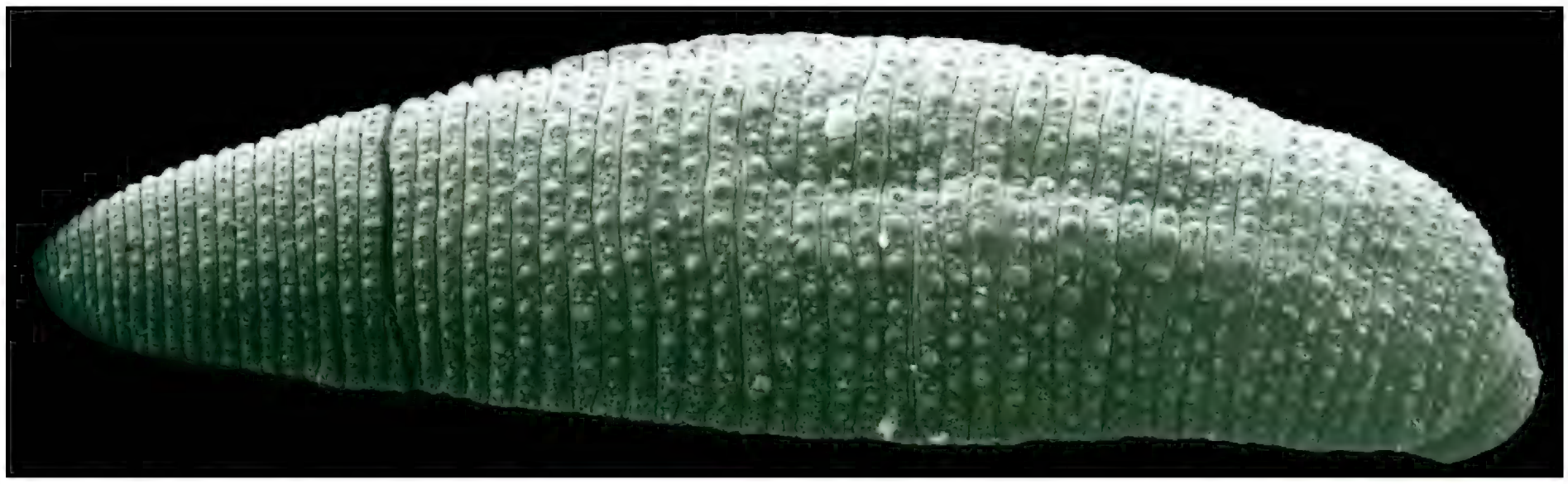

Figure 25. *Alboglossiphonia polypompholyx*, Nile in Egypt, Photo: Dr. N. El-Shiemy (Assiut).

Figure 26. *Alboglossiphonia* cf. *polypompholyx*, dorsal, Ethiopia, Wouramboulchi, BMNH London, coll. no. BMNH 1933.1.19.16-18, photo: P. Michalik.

Figure 27. *Alboglossiphonia* cf. *polypompholyx*, ventral, Ethiopia, Wouramboulchi, BMNH London, coll. no. BMNH 1933.1.19.16-18, photo: P. Michalik.

typicus) is near the town of El-Simbellawein, about 140 km north-east of Cairo at a small irrigation canal (tributary to the eastern main arm of the Nile). Other leech species at this station were *Salifa* spp., *Barbronia assiuti* and *Alboglossiphonia polypompholyx*. It is not known whether the entire Nile Delta is colonized, but it is likely.

Alboglossiphonia levis Gouda, 2010

This species appears to be the rarest of the genus in Egypt. So far, *Alboglossiphonia levis* has only been found in the Al Sont Canal in Assiut, located between Cairo and Luxor (Gouda 2010). The animals were collected between 2006 and 2007 (December to January). They colonize

Figure 28. Distribution of *Alboglossiphonia polypompholyx*.

various substrates, e.g., stones, plastic sheets, snail shells and can also be found in mud. The site is heavily eutrophic and polluted. The only other leech species found was *Salifa delicata* (Moore, 1939). No specimens have been found since the species was described. Except for a hardly informative photo (Gouda 2020) no illustration of this species is known. The holotype dried up during transport to London (oral communication E. Sherlock) and is no longer usable. Other specimens could not be examined in the course of this work.

Alboglossiphonia disjuncta (Moore, 1939)

Synonyms: *Glossiphonia disjuncta* Moore, 1939, *Glossiphonia heteroclita* (Linnaeus, 1761) partim., *Glossiphonia weberi* (Blanchard, 1897) partim., *Glossiphonia verrucata* Sciacchitano, 1939

The species was described from Lake Bunyoni in Uganda (Moore 1939; Figs 32, 33) and was previously known as *Glossiphonia weberi* (Moore, 1933). All later references concerning Uganda refer to this record (e.g., Sciacchitano 1952, 1963a, 1967; Meyer 1968; Oosthuizen 1978a, b, 1991). Between 1952 and 1967 Sciacchitano published numerous works in which he specified *Alboglossiphonia disjuncta* for the Democratic Republic of Congo, Togo, Kenya and South Africa, but which, according to the present revision, do not all belong to this species. Two records of *Alboglossiphonia disjuncta* in Sciacchitano (1960) from the Mt. Elgon massif in Kenya refer to the species *A. afroalpina* sp. nov. described above, two other records from Bunia in the Democratic Republic of the Congo (Sciacchitano 1952) to the newly described *A. buniana* sp. nov. Two other specimens from the Democratic Republic of Congo do not belong to *Alboglossiphonia disjuncta* but to *A. namaquaensis* (see below).

Only one voucher from the Central Africa Museum in Tervuren could be confirmed as *Alboglossiphonia disjuncta* from the Democratic Republic of Congo, Weka on the Senze River in the Congo-Central Province, July 1937, leg. Dartevelle (RMAT, Coll.-No. 25907) (Sciacchitano 1952).

For Togo, Sciacchitano (1965) reports a record (one specimen) of *Alboglossiphonia disjuncta*, from a tributary of the Lili between Tsévié and Agbatopé in the province of Maritime, leg. Y. Duc, 06/29/1963 (Sciacchitano 1965). The evidence could be verified on the basis of the eyes, the distance of the gonopores, the shape and size of the suckers and the arrangement of the papillae (Figs 35, 36). However, the papillae appear somewhat more diffuse and less clearly arranged in rows.

Harding (1932) published the first record for Ethiopia, initially as *Glossiphonia heteroclita* Linnaeus, 1761. Moore (1939) and Sciacchitano (1952) also mention this finding, Wouramboulchi west of Addis Ababa. This animal is deposited in the NHM London (Coll. No. BMNH 1933.1.19.16-18) and does not belong to *Alboglossiphonia disjuncta* but probably to *A. polypompholyx* (see above). But another record from Ethiopia, deposited under the same collection number, can be verified in its determination, although the animals are not well preserved. Both specimens were collected by J. Omer-Cooper on November 28, 1926, in the Water Hole North of Make River. For Ethiopia, Sciacchitano (1967) lists a total of four records. Two of these are in the vicinity of Debra Berhan northeast of Addis Ababa, one at Lake Awasa and another at Shashamane northeast of Awasa. Both sites are south of Addis Ababa.

Oosthuizen (1978b) doubts the records of *Alboglossiphonia disjuncta* provided by Sciacchitano (1959, 1963a) in the Transvaal (province in north-eastern South Africa), since the animals deposited by him in the museum there under this species belong to *Batracobdelloides tricarinata* (R. Blanchard, 1897; synonyms *Batracobdella nilotica* Autrum, 1936 or *Clepsine nilotica* Johansson, 1909). He even goes so far as to ignore all evidence of Sciacchitano from the Democratic Republic of Congo, Togo and Ethiopia. At least the specimens belonging to the genus *Alboglossiphonia* from the museums in Tervuren (Belgium) could be revised in the present work.

The species *Glossiphonia verrucata* Sciacchitano, 1939, (not identical to the *Glossiphonia verrucata* (Fr. Müller, 1844) which is boreally distributed in Europe and North Asia), is an interesting case. There are 3 specimens in the Africa Museum Tervuren under the coll. no. 23517 et 23518, which can be clearly assigned to the genus *Alboglossiphonia* based on the position of the eyes and the gonopores. One individual is very well preserved (Fig. 37). The other two do not show all the characteristics, as they are almost broken in the middle or compressed several times. The animals were found in "Kimuenge, west of Lukula, Yanga River, Shiloango Basin" (leg. Dr. E. Dartevelle). In Sciacchitano (1963): "Congo: Léopoldville (old French name for Kinshasa and the province of the same name)". The Yanga River system lies just north of the Congo but has no direct connection with it. The site is located in the province of Congo-Central, not far from the Angolan exclave of Cabinda. In

Figure 29. *Alboglossiphonia disuqi*, dorsal, Egypt, Nile Delta, irrigation canal near El-Simbellawein, holotype, BMNH London, Coll.-No. BMNH 1989.1.1, photo: P. Michalik.

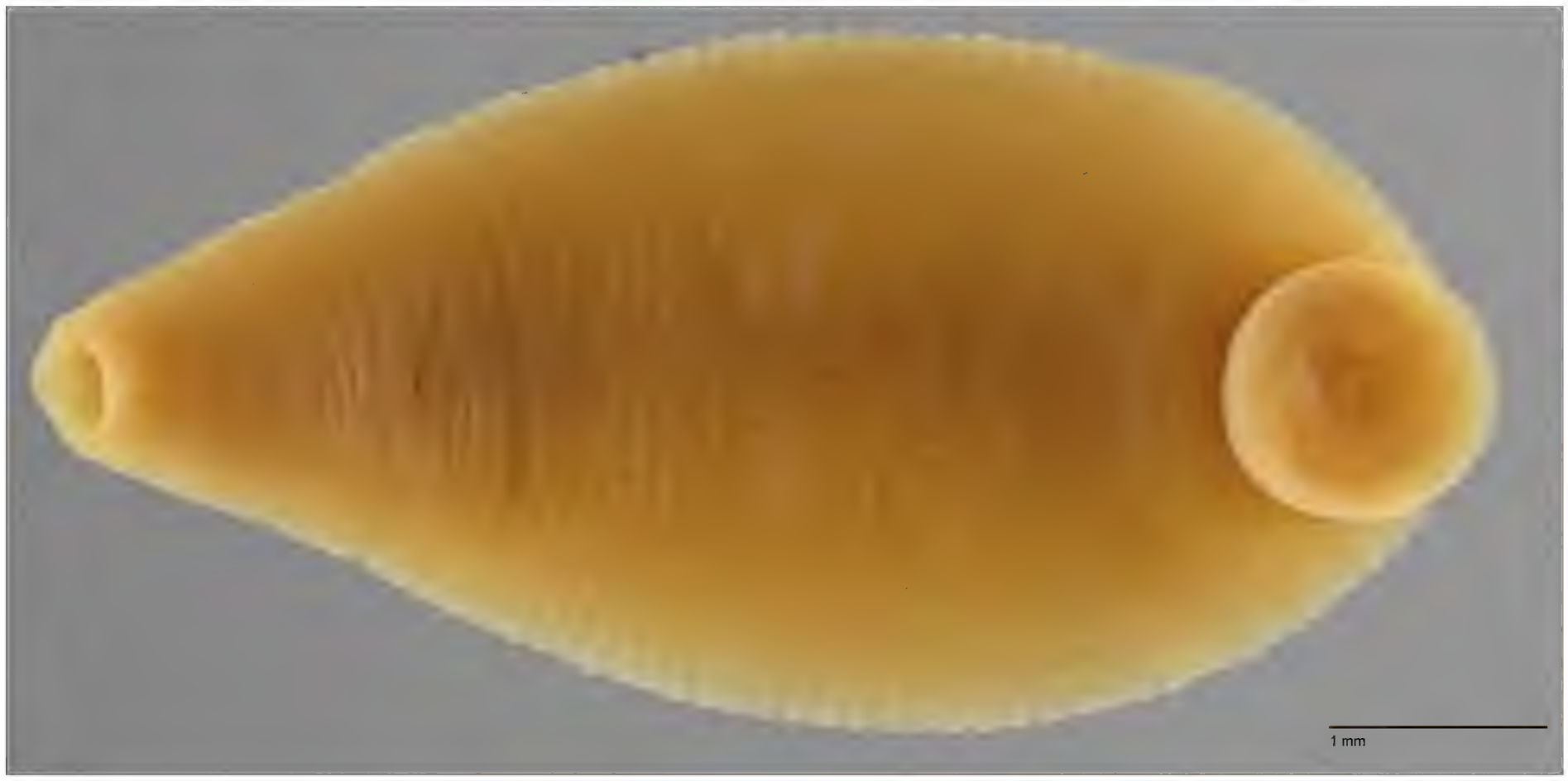

Figure 30. *Alboglossiphonia disuqi*, ventral, Egypt, Nile Delta, irrigation canal near El-Simbellawein, holotype, BMNH London, Coll.-No. BMNH 1989.1.1, photo: P. Michalik.

the short description of the species (Sciacchitano 1939) he refers primarily to the papillae, which is supposed to justify a new species. According to current examinations, the species *Glossiphonia verrucata* Sciacchitano, 1939 can be placed in the synonymy of *Alboglossiphonia disjuncta*. The arrangement of the papillae is not as regular as shown in Sciacchitano (1939) and falls within the range of variation of *Alboglossiphonia disjuncta*. The sickle-shaped eyes, the formation of the intestinal ventricles, the spacing of the gonopores and the formation of the suction cups also point to *Alboglossiphonia disjuncta*. A diagnosis of the three specimens (syntypes) is shown in Table 3.

Oosthuizen (1978a) names 43 localities in South Africa where the species is apparently widespread; and later four more from the Kruger National Park (Oosthuizen 1991). From Namibia, Oosthuizen and Curtis (1990) report two localities from the northern part of the country. According to Rückert (1985), *Alboglossiphonia disjuncta* is also said to occur in Syria. However, the examination of the specimen deposited in the Senckenberg Museum

Figure 31. Distribution of *Alboglossiphonia disuqi*.

Figure 32. Distribution of *Alboglossiphonia levis*.

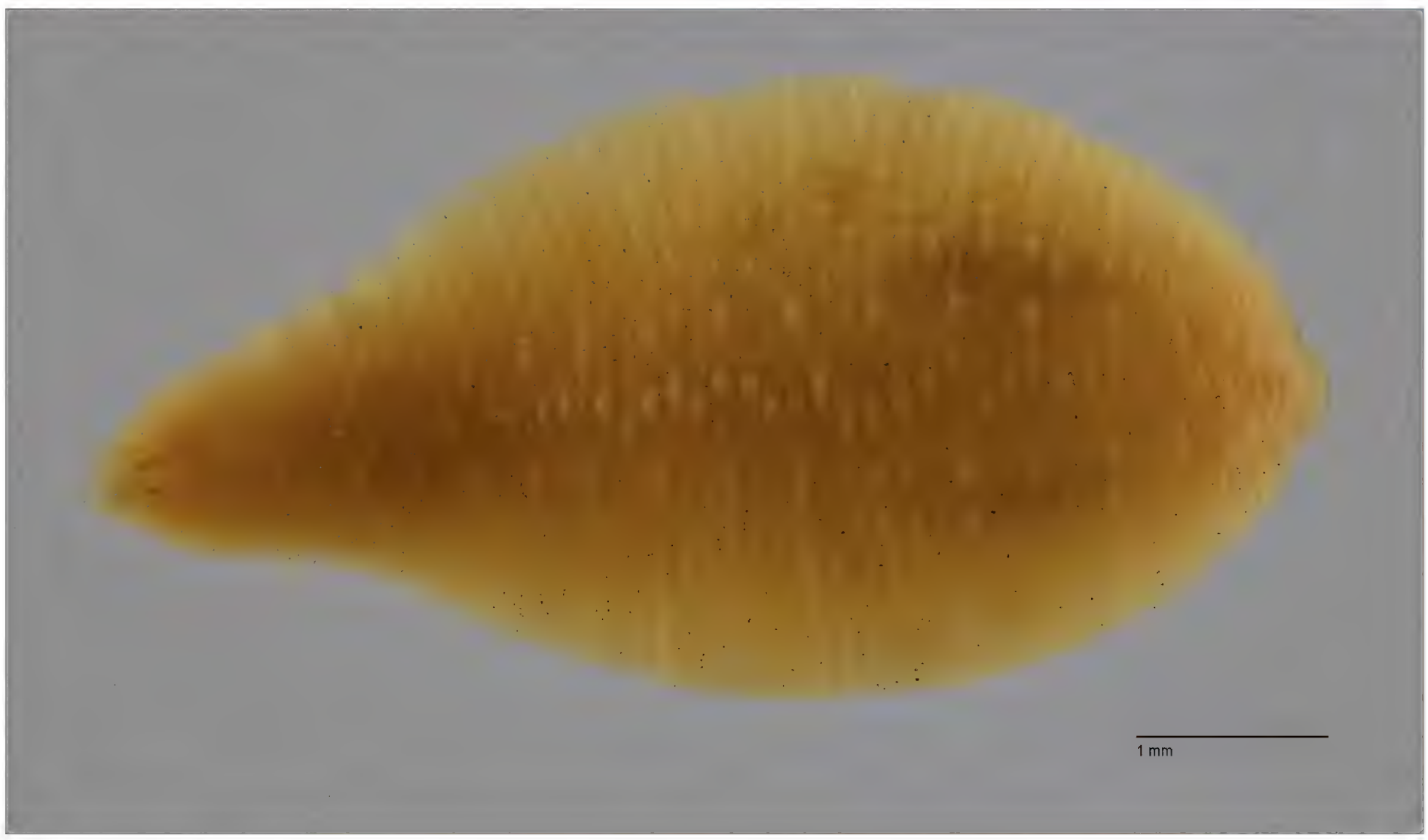

Figure 33. *Alboglossiphonia disjuncta*, dorsal, Uganda, Lake Bunyoli, 08/13/1931, leg. E. B. Worthington, holotype, BMNH London, Coll. BMNH 1933.1.21.17, photo: P. Michalik.

in Frankfurt am Main showed that it is not the species mentioned, but probably a juvenile animal of *Placobdella costata* (Fr. Müller, 1846). Thus, all known records of *Alboglossiphonia disjuncta* remain in Africa.

Moore (1939), Sciacchitano (1967) and Oosthuizen (1978a) placed *Alboglossiphonia namaquaensis* from Namibia, described by Augener in 1936, in the synonymy of *A. disjuncta*, which proved to be wrong after the most recent revision (see below).

According to the current state of knowledge, there is reliable evidence of *Alboglossiphonia disjuncta* from Uganda, Ethiopia, the Democratic Republic of Congo, Togo, South Africa and Namibia. According to Oosthuizen and Siddall (2003), the species is widespread and common throughout southern Africa.

It would be worthwhile to study the intraspecific range of variation of different traits of *Alboglossiphonia disjuncta*. This may be a species complex.

Figure 34. *Alboglossiphonia disjuncta*, ventral, Uganda, Lake Bunyoli, 08/13/1931, leg. E. B. Worthington, holotype, BMNH London, Coll. BMNH 1933.1.21.17, photo: P. Michalik.

Figure 35. *Alboglossiphonia disjuncta*, dorsal, Togo, between Tsévié and Agbatopé, in a tributary of the Lili, 06/29/1963, leg. Y. Duc, RMAT 33162, photo: A. Henrard.

Figure 36. *Alboglossiphonia disjuncta*, ventral, Togo, between Tsévié and Agbatopé, in a tributary of the Lili, 06/29/1963, leg. Y. Duc, RMAT 33162, photo: A. Henrard.

Figure 37. *Alboglossiphonia disjuncta*, dorsal, specimen 1 of *Glossiphonia verrucata* Sciacchitano, 1939, RMAT coll. no. 23517 et 23518, photo: A. Henrard.

Table 3. Characterization of the type material used by Sciacchitano (1939) to describe *Glossiphonia verrucata*, now a junior synonym of *Alboglossiphonia disjuncta* (Moore, 1939), RMAT (Coll. No. 23517 et 23518).

	Specimen 1	Specimen 2	Specimen 3
Shape and size	oblong-oval; length 7,5 mm; maximum width 2,5 mm	oblong-oval; length 9,0 mm; maximum width 2,4 mm; Animal almost broken in the middle, front end turned over	oblong-oval; length ?; maximum width 3,0 mm; Animal folded up" several times
Head region	indistinctly set off	indistinctly set off	indistinctly set off
Colour	? (fixed light colorless)	? (fixed light colorless)	? (fixed light colorless)
Mottle/pattern			
Papills and tubercles	dorsally many prominent papillae, per annulus at least 12, larger papillae on every third ring, arranged in 5–7 rows; ventrally smooth	dorsally many prominent papillae, per annulus at least 12, ventrally smooth	dorsally many prominent papillae, per annulus at least 12, ventrally smooth
Eyes	6, 1st pair close together, small, 2. and 3. pair fused left and right, much further apart, V-shaped	6, 1st pair close together, small comma shaped, 2. and 3. Paar jeweils links und rechts schräg verschmolzen, deutlich weiter auseinander, breit V-förmig	6, 1st pair confused, 2. and 3. pair closely together left and right (single eyes crescent-shaped), V-shaped
Cranial sucker	small, extended proboscis (1,1 mm long); 0,25 × 0,35 mm	somewhat elongated/triangular, proboscis slightly extended; 0,20 × 0,20 mm	somewhat elongated/triangular, proboscis slightly extended (tip only); 0,35 × 0,38 mm
Mouth	in the middle, big	in the middle, slightly fissured	in the middle, slightly transverse
Caudal sucker	circular, flat/even; 0,95 × 0,95 mm	circular, flat/even; 1,10 × 1,10 mm	circular, flat/even; dimensions ?
Crope caeca	7 (?), Postcaeca very well visible (with 4 simple lateral lobes)	7 (?), 6 visible against the light (all unlobed), postcaeca not visible	?
Gonopores	2, separated by 2 annuli	? (front end turned over)	2, separated by 2 annuli

Figure 38. Distribution of *Alboglossiphonia disjuncta.*

Alboglossiphonia conjugata (Oosthuizen, 1978)

Synonym: *Batracobdella conjugata* Oosthuizen, 1978

According to current knowledge, *Alboglossiphonia conjugata* is restricted to South Africa and Namibia. The first description was based on specimens from Namibia (reservoir of the rest camp Daan Viljoen Game Park in the Khomas Hochland), (Figs 39, 40; Oosthuizen 1978a). With 13 localities, there are quite a few records in Namibia (Oosthuizen and Curtis 1990). From South Africafour records have been published (Oosthuizen 1978a). Oosthuizen (1991) mentions three further observations of *Alboglossiphonia conjugata* from the Krüger National Park in South Africa. According to Oosthuizen and Siddall (2003), the species is distributed throughout southern Africa, but only common in the north-western part. It can be assumed that *Alboglossiphonia conjugata* may also be found in the countries bordering to the north (e.g. Angola, Zambia, Botswana, Zimbabwe, Mozambique).

Alboglossiphonia macrorhyncha (Oosthuizen, 1978)

Synonym: *Glossiphonia macrorhyncha* Oosthuizen, 1978

Alboglossiphonia macrorhyncha shows an unusual distribution pattern. According to Oosthuizen (1978b), the species occurs only in a narrow band along the coast of northeastern South Africa, stretching from the Mozambique border south to Lesotho. According to Oosthuizen and Siddall (2003), *Alboglossiphonia macrorhyncha* is common in the eastern parts of southern Africa and completely absent from the western part. A distant record has been published from the southern end of Lake Kinneret in Israel (Bromley 1994). Apparently, there is no doubt about the species affiliation, since Oosthuizen is said to have determined the animals himself (mentioned as a personal communication in the work). However, it is extremely doubtful whether he had the original animals in front of him. A mix-up is to be assumed in the opinion of the author.

Alboglossiphonia namaquaensis (Augener, 1936)

Synonyms: *Clepsine namaquaënsis* Augener, 1936, *Alboglossiphonia namaquaënsis* (Augener, 1936), *Glossiphonia heteroclita* (Linnaeus, 1761) partim., *Batracobdella cheili* Oosthuizen, 1978, *A. cheili* (Oosthuizen, 1978)

The species name of *Alboglossiphonia namaquaënsis*, described by Augener in 1936, refers to "Namaqualand", a region on both sides of the Orange River in Namibia and South Africa, where the Nama people live. The ë contained in the name is a diacritical mark, which in this case is supposed to regulate the stress. According to the applicable nomenclature rules, such special charac-

Figure 39. *Alboglossiphonia conjugata*, dorsal, Namibia, holotype, BMNH London, Coll.-No. BMNH 1978.20.30-60, photo: P. Michalik.

Figure 40. *Alboglossiphonia conjugata*, ventral, Namibia, holotype, BMNH London, Coll.-No. BMNH 1978.20.30-60, photo: P. Michalik.

ters are no longer permitted, so that an e must be written instead of the ë.

Until now, the systematic classification of *Alboglossiphonia namaquaensis* has been problematic, because important characters were not recognizable in the three animals found. Moore (1939) and Oosthuizen (1978a) placed *Alboglossiphonia namaquaensis* in the synonymy of *A. disjuncta*. They referred to Augener's description (1936), but never saw the animals themselves. The specimens deposited in the Zoological Museum in Hamburg (lectotype ZMH V-12790a and paralectotypes ZMH V-12790b, here designated) are revised here to clarify the systematic position of this species.

The three animals were collected on May 13, 1911, by Prof. W. Michaelsen (Hamburg) in a pond on the Frauenstein farm near Neudamm (50 km ENE Windhoek, Namibia). Another species was found in the same pond, *Clepsinides windhukensis* Augener, 1936. According to this revision, these specimens must be assigned to the species *Placobdelloides multistriata* (Johansson, 1909).

Figure 41. Distribution of *Alboglossiphonia conjugata.*

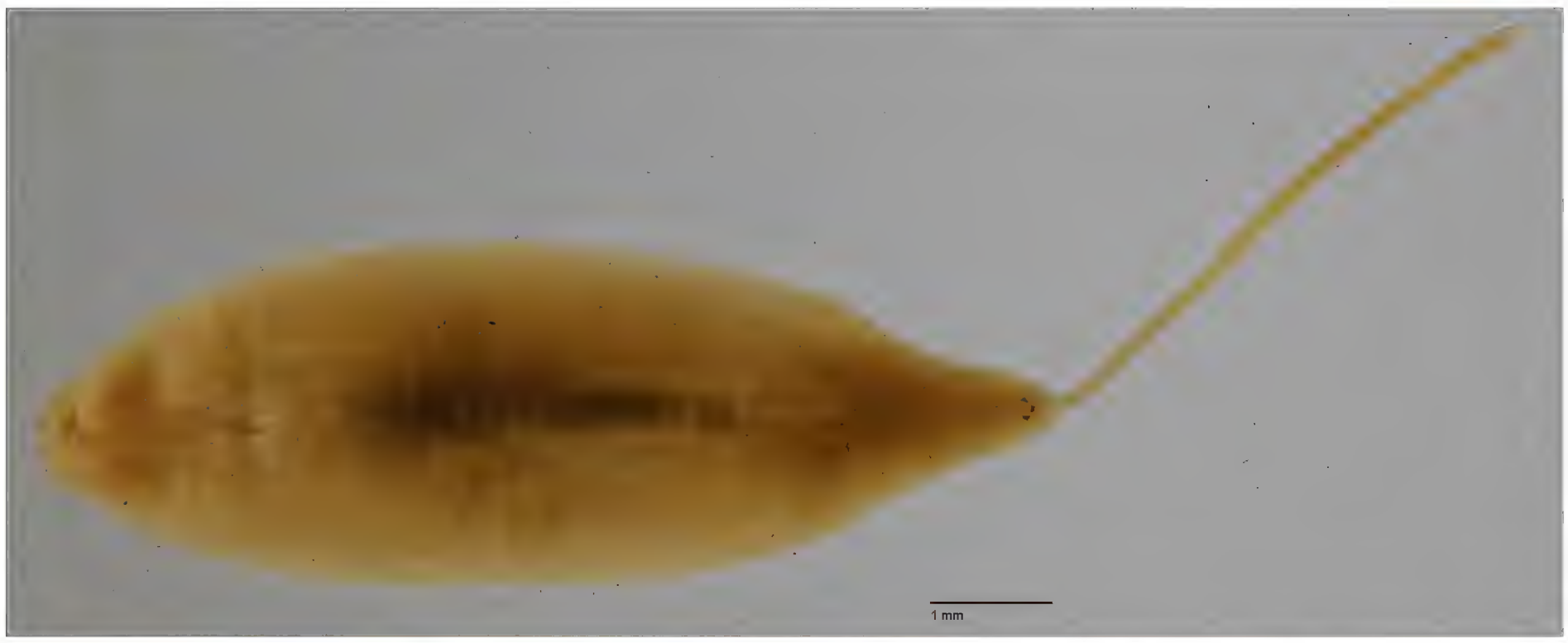

Figure 42. *Alboglossiphonia macrorhyncha*, dorsal, South Africa, holotype, BMNH London, Coll.-No. BMNH 1978.2.1, photo: P. Michalik.

Figure 43. *Alboglossiphonia macrorhyncha*, ventral, South Africa, holotype, BMNH London, Coll.-No. BMNH 1978.2.1, photo: P. Michalik.

Farm Frauenstein is located on the White Nossob, which flows into the Oranje, one of the largest rivers in south-west Africa. The White Nossob has not had any water for several decades, so there is little probability of being able to collect new material there for redescription. The pond that existed on the farm site in 1911 will almost certainly no longer exist. In the Windhoek region, Oosthuizen and Curtis (1990) found *Alboglossiphonia cheili* and *A. conjugata*, the former more common.

According to Augener (1936), *Alboglossiphonia namaquaensis* has the following characteristics (abbreviated and summarized): body shape like *A. heteroclita* or *A. weberi*, 7 mm long, 3.5 mm wide; light, ochre-yellowish, without dark markings; with papillae, 3 longitudinal rows of larger papillae, the dorso-median one partly noticeable as a longitudinal keel, the other rows run approximately in the middle between the dorsal longitudinal midline and the lateral edges; small scattered papillae perceptible dorsally; eyes like *Alboglossiphonia*, sometimes seeming fused; young on the abdomen, therefore bell-shaped and

Figure 44. Distribution of *Alboglossiphonia macrorhyncha.*

Table 4. Characterization of the three types of *Alboglossiphonia namaquaensis*, ZMH V-12790).

	Lectotype	Paralectotype 1	Paralectotype 2	Total
Shape and size	länglich-oval, oberseits gewölbt, ventral glockenförmig eingekrümmt; Länge 7,1 mm; max. Breite in 2. Körperhälfte 3,5 mm; Höhe 2 mm	ventral glockenförmig eingekrümmt (Individuum stark zusammengedrückt); Länge ca. 6 mm; max. Breite in 2. Körperhälfte ca. 3 mm, Höhe 2,5 mm	länglich-oval, oberseits gewölbt, ventral glockenförmig eingekrümmt; Länge 7,5 mm; max. Breite in 2. Körperhälfte 3,6 mm; Höhe 2,7 mm	länglich-oval, oberseits gewölbt, ventral glockenförmig eingekrümmt; Länge bis 7,5 mm; max. Breite in 2. Körperhälfte bis 3,6 mm; Höhe bis 2,7 mm
Head region	short, set off by a nuchal furrow	short, set off by a nuchal furrow	short, clearly set off by a nuchal furrow	short, clearly set off by a nuchal furrow
Colour	beige?	beige?	beige?	beige?; probably alive yellowish-brownish
Mottle/pattern	> 30 thin, very faint appearing dark, partly interrupted, longitudinal rows (clearly visible in the backlight); Edge transparent	> 30 thin, very faint appearing dark, partly interrupted, longitudinal rows (clearly visible in the backlight); Edge transparent	ca. 30 thin, very faint appearing dark, partly interrupted, longitudinal rows (clearly visible in the backlight); Edge transparent	30 thin, very faint appearing dark, partly interrupted, longitudinal rows (clearly visible in the backlight); Edge transparent
Papills and tubercles	small flat papillae evenly distributed over the body; looks rather smooth, median slight increase recognizable (no crest)	none; Skin surface uneven due to sensory papillae, but no prominent papillae	small flat papillae evenly distributed over the body; looks rather smooth, sensory papillae equally present; median slight increase recognizable (no crest)	Prominent papillae absent, small flat papillae evenly distributed over the body; looks rather smooth, median slight increase recognizable (no crest)
Eyes	6; 1st pair close but separated, slightly shifted to the righ, on a4, distance between 1. and 2. pair greater than between 2. and 3. pair; 2. and 3. pair merged left and right respectively, on a6	6; 1st pair fused but separated, on a4; 2. and 3. pair each left and right fused, auf a6	6; 1st pair fused but separated, on a4; 2. and 3. pair each left and right fused, on a6	6; 1st pair fused, partially merged, on a4; 2. and 3. pair each left and right fused, on a6
Cranial sucker	roundish-acrossoval, moderately deep, thin walls; 0,8 × 0,9 mm	roundish-acrossoval, moderately deep, thin walls; 0,6 × 0,8 mm	oblong-oval, moderately deep, thin walls; 0,6 × 0,5 mm	roundish-acrossoval, moderately deep, thin walls; 0,6 × 0,7 mm
Mouth	in the centre, big	in the centre, slightly fissured	in the centre, slightly transverse	in the centre, different sized
Caudal sucker	acrossoval, almost square, moderately thick walls; 1,3 ×1,0 mm; directed ventrally	oblongoval; 1,1 × ? mm (strongly compressed); directed ventrally	roundish; 1,0 × 1,0 mm; directed ventrally	oblongoval, moderately thick walls; 1,1 × 1,0 mm; directed ventrally; posterior edge barely visible from dorsal
Crope caeca	?	?	?	?
Gonopores	? (possibly 2, separated by 2 annuli)	?	2, separated by 2 annuli)	2, separated by 2 annuli, very small, hard to see
Eggs/juvenils *	none	30 Juveniles ventral	26 eggs ventral	clutches with at least 30 eggs/ juveniles

*Augener (1936): "all of them carried young on their bellies"; Presumably some eggs or juveniles have fallen off over time.

ventrally curved, about 70 annuli. According to Augener (1936), important characteristics such as the distance between the gonopores, the number of intestinal ventricles or the formation of the suction cups could not be recognized or were not diagnosed. For this reason, this species has so far been listed as a *nomen dubium* (Oosthuizen 1978a) or synonymized (see above). The current revision revealed additional characteristics that are important for species diagnosis (Table 4), e.g., the spacing of the gonopores and the arrangement of the longitudinal stripes. Contrary to Augener's observations, no prominent papillae could be observed, only sensory papillae. The crest he described in the middle of the body results from a contraction during fixation, as is occasionally observed in glossiphonids. Since the oral suction cup has an extended front lip (slightly folded in), it appears that the mouth opening is not in the middle but slightly above it.

A comparison of *Alboglossiphonia namaquaensis* with the known *Alboglossiphonia* species from southern Africa (Table 6) shows an above-average number of similarities with *A. cheili*. It should be noted here that the shape and size of the animals, the basic colour, the eyes and the invisible intestinal ventricles were not used as species diagnostic characters in this case,

Figure 45. *Alboglossiphonia namaquaensis*, dorsal, Lectotype, length 7.1 mm, photo: P. Michalik.

Figure 46. *Alboglossiphonia namaquaensis*, ventral, Lectotype, length 7.1 mm, photo: P. Michalik.

since they have been changed or are unknown due to the preservation. In almost all of the nine parameters examined (Table 4), *Alboglossiphonia namaquaensis* falls within the range of variation of *A. cheili*. Only the mouth opening differs somewhat with its position. There are five similarities with *Alboglossiphonia conjugata*. However, because the spacing of the gonopores, which is an extremely important feature, is different, these species cannot be identical. Only three matches could be found with *Alboglossiphonia disjuncta* and only one with *A. macrorhyncha*, so that here too an identity of both species with *A. namaquaensis* can be excluded. As a result of this revision, *Alboglossiphonia namaquaensis* turns out to be identical with *A. cheili*. According to the rules of nomenclature, *Alboglossiphonia cheili* (Oosthuizen, 1978) must be placed in the synonymy of *A. namaquaensis* (Augener, 1936).

The type material for *Alboglossiphonia cheili* (Figs 49, 50) comes from a waterhole in the Cuvelai Basin in Ovamboland, Namibia (Oosthuizen 1978a). A few years later, Oosthuizen and Curtis (1990) could already list eleven localities for Namibia. Oosthuizen (1978a) names

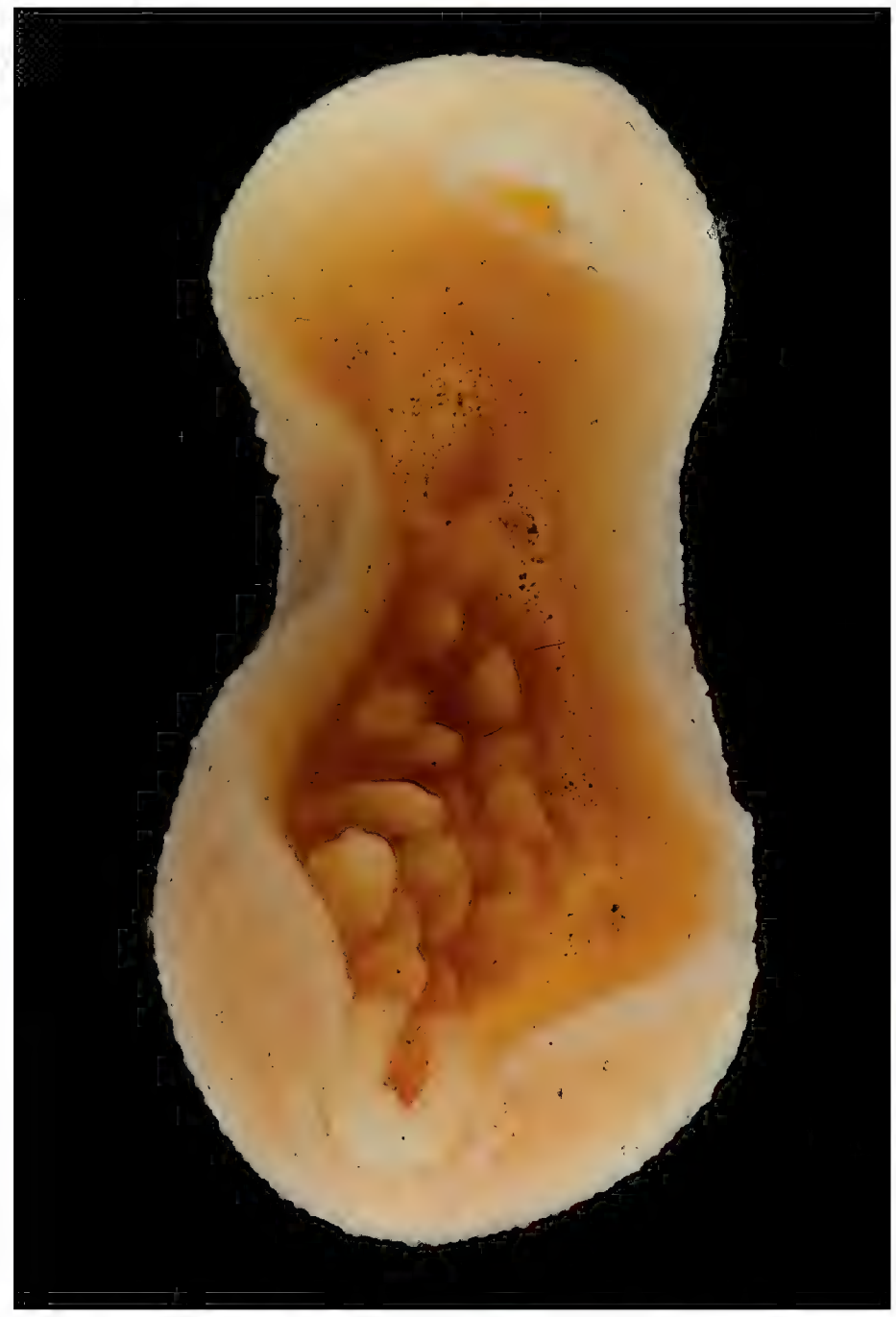

Figure 47. *Alboglossiphonia namaquaensis*, ventral, Paralectotype 1 (with juveniles), length approx. 6 mm, photo: P. Michalik.

Figure 48. *Alboglossiphonia namaquaensis*, lateral, Paralectotype 2, length ca. 6 mm, photo: P. Michalik.

five localities for the area of South Africa. According to Oosthuizen and Siddall (2003), the species is distributed throughout southern Africa, but common only in the northwestern part (Namibia).

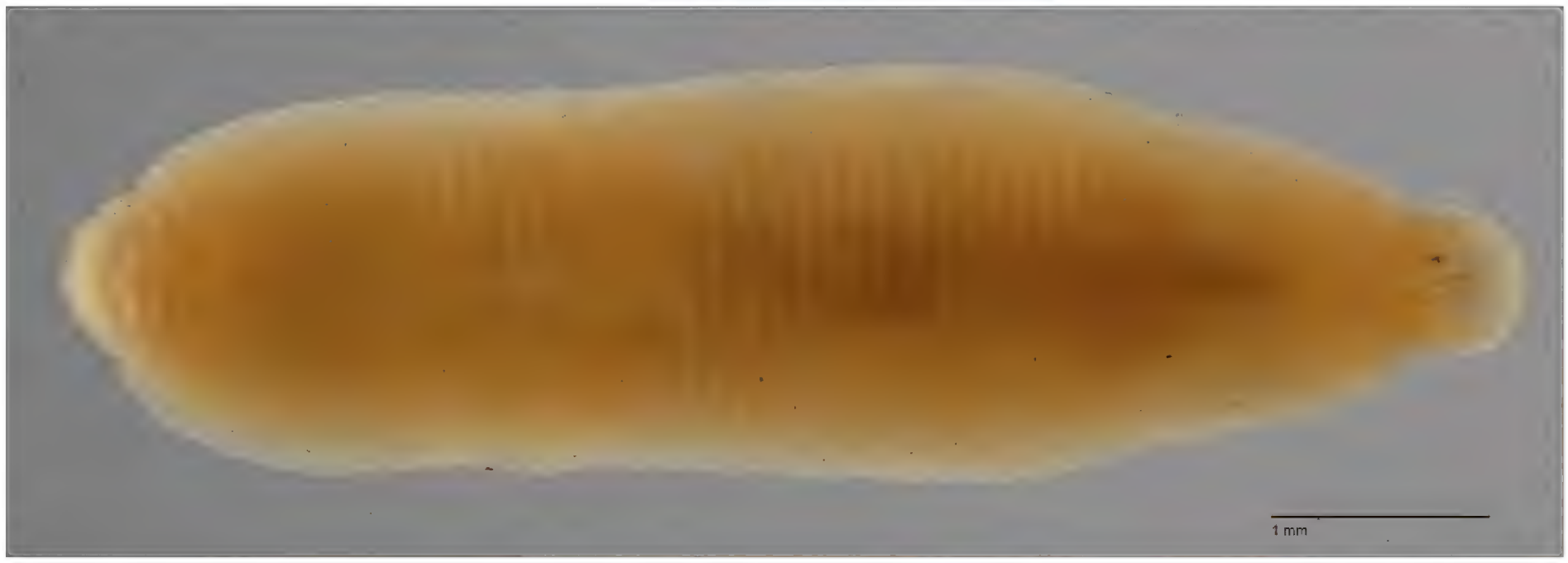

Figure 49. *Alboglossiphonia namaquaensis*, dorsal, Namibia, holotype of *A. cheili*, BMNH London, coll. no. BMNH 1978.20.1-6, photo: P. Michalik.

Figure 50. *Alboglossiphonia namaquaensis*, ventral, Namibia, holotype of *A. cheili*, BMNH London, coll. no. BMNH 1978.20.1-6, photo: P. Michalik.

Figure 51. *Alboglossiphonia namaquaensis*, dorsal, Democratic Republic of Congo, Tanganyika Province, Kiambi, leg. Gérard, RMAT, coll. no. 588 & 564, photo: A. Henrard.

Figure 52. *Alboglossiphonia namaquaensis*, ventral, Democratic Republic of Congo, Tanganyika Province, Kiambi, leg. Gérard, RMAT, coll. no. 588 & 564, photo: A. Henrard.

In the Africa Museum Tervuren (Belgium) under the coll. no. 558 et 564 there are 10 voucher specimens labeled *Glossiphonia heteroclita* L. (Kiambi, 1934, leg. Dr. Gérard; Sciacchitano 1935; Figs 51, 52). In a later work, the specimens were assigned to the species *Alboglossiphonia disjuncta* (Sciacchitano 1952). The city of Kiambi is located on the Luvua River in Tanganyika Province. After examining the 10 specimens, which are in very good condition, it can be determined that they belong to the species

Alboglossiphonia namaquaensis. The following important features could be diagnosed in the 10 animals: body elongated-oval, head area clearly separated, approx. 30 dark lines, smooth surface (only sensory papillae), gonopores separated by 2 annuli, 7 crop caeca (the first 6 bilobed), cranial sucker round to slightly oblong and deep, caudal sucker less than half of body width, circular and flat. A second voucher (two specimens) from the Africa Museum Tervuren (Belgium) (Coll.-No. 29802-29803) from the Democratic Republic of the Congo, province of Sud-Kivu, Litana, Lac Lungwe, leg. G. Marlier, 26.2. 1953, can also be assigned to *Alboglossiphonia namaquaensis*. Sciacchitano identified and published this as *Alboglossiphonia disjuncta* (Sciacchitano 1960, 1963). The following characteristics were the basis of the reclassification: body shape, eye position, deep suction cups, transparent border, no papillae (only inconspicuous sensory ones), 2 gonopores separated by 2 rings and about 30 longitudinal stripes.

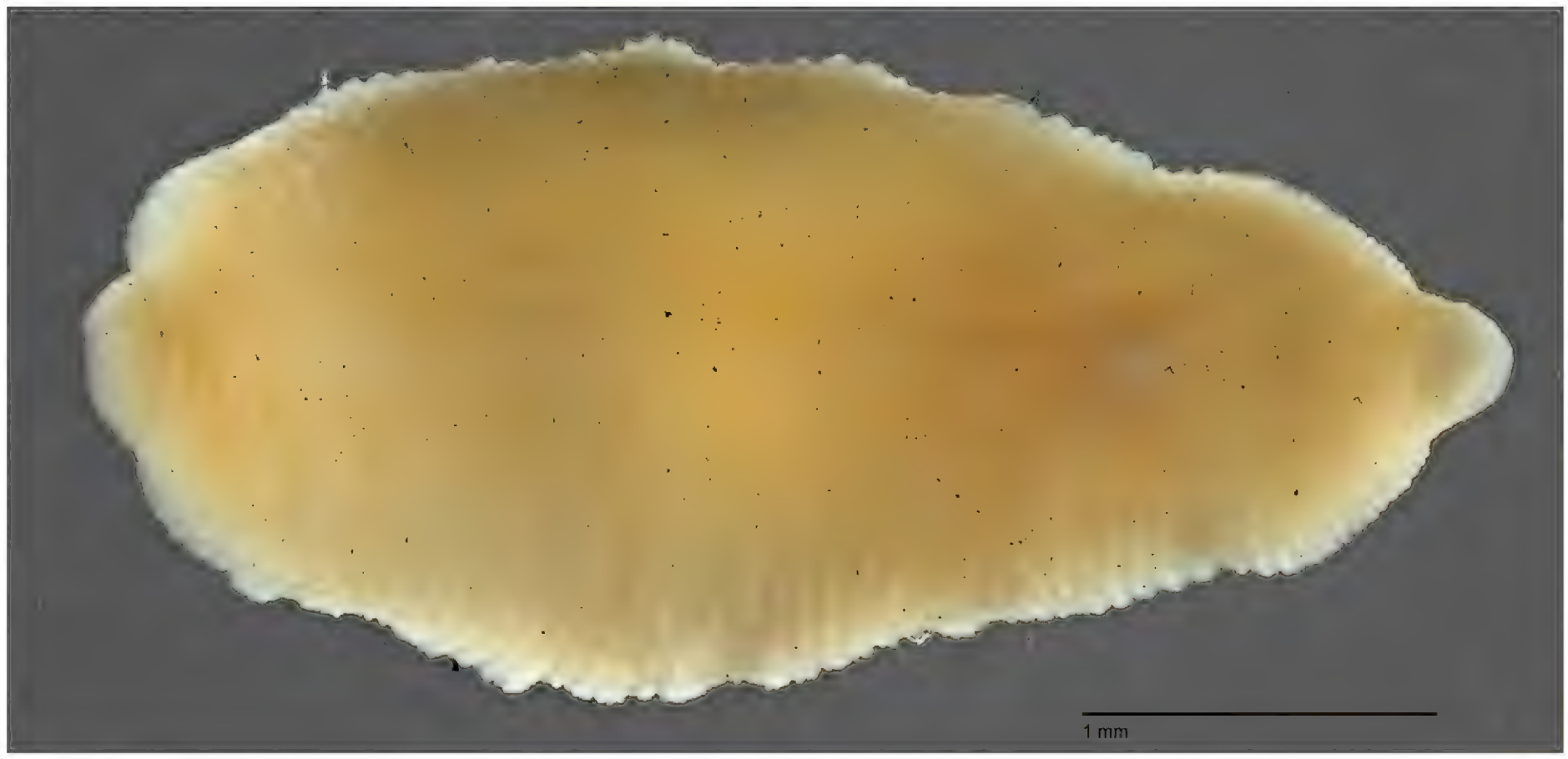

Figure 53. *Alboglossiphonia namaquaensis*, dorsal, Kenya, Nyahuvuru, BMNH London, coll. no. BMNH 1993.2.6-18, photo: P. Michalik.

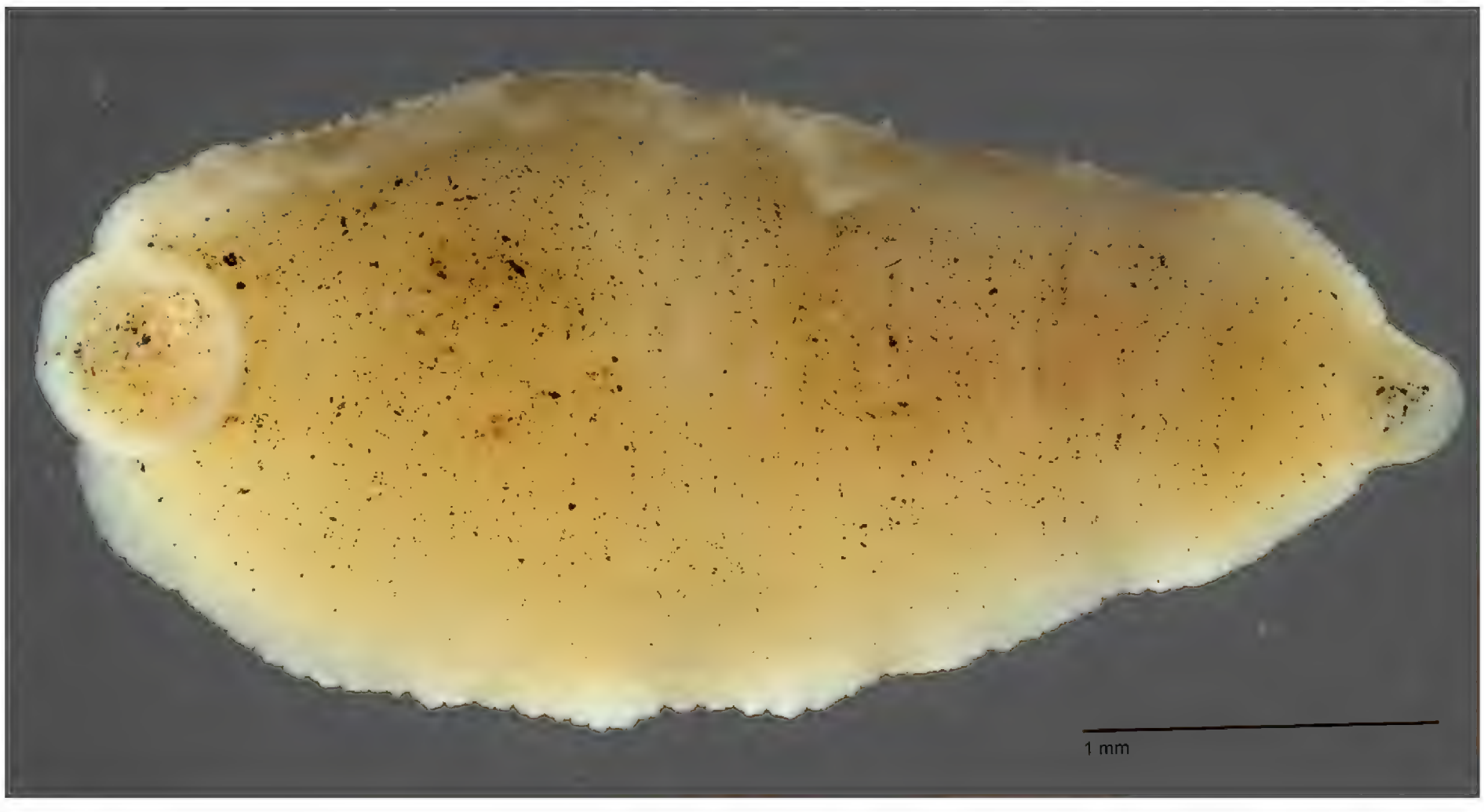

Figure 54. *Alboglossiphonia namaquaensis*, ventral, Kenya, Nyahuvuru, BMNH London, coll. no. BMNH 1993.2.6-18, photo: P. Michalik.

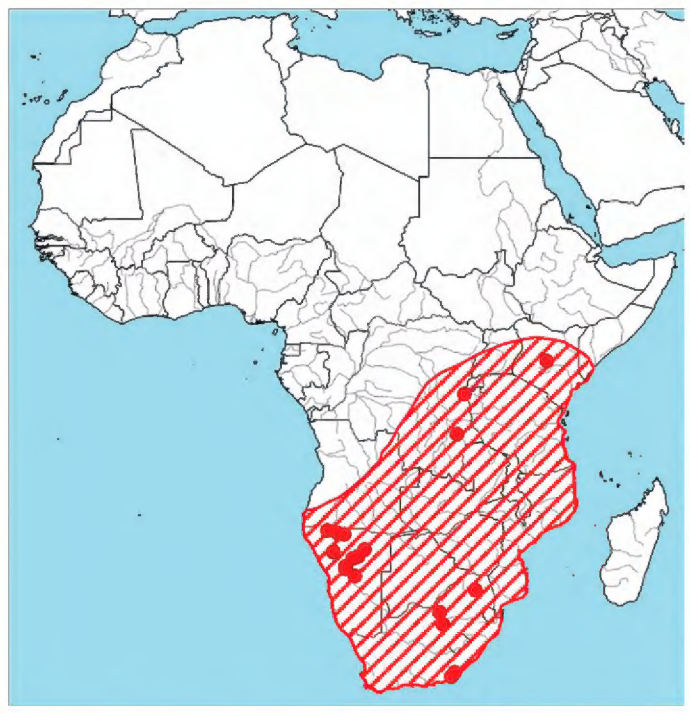

Figure 55. Distribution of *Alboglossiphonia namaquaensis*.

A specimen of this species was also found among the material in the Natural History Museum London, which was inventoried under *Alboglossiphonia cheili*, and which, according to the current nomenclature, must now be called *A. namaquaensis*. Under the coll. no. BMNH 1993.2.6-18 13 specimens are deposited, which were collected on August 21, 1984 in Kenya, Nyahuvuru, in the Ewaso Narbk River by C. A. Fisher and determined by J. H. Oosthuizen (Figs 53, 54).

Thus, *Alboglossiphonia namaquaensis* is known from Namibia, South Africa, the eastern and south-eastern parts of the Democratic Republic of Congo and Kenya. It can be assumed that *A. namaquaensis* can also be found in the states between (e.g. Tanzania, Angola, Zambia, Botswana, Zimbabwe, Malawi, Mozambique).

Table 5. Characteristics of African *Alboglossiphonia* species (north of the Sahara), Palaearctic. Based on Gouda (2010) with additions from Nesemann and Neubert (1999), Jueg (2008), Oosthuizen et al. (1988), El Shimy (1990).

	***A. hyalina* (O. F. Müller, 1774)**	***A. iberica* Jueg, 2008**	***A. polypompholyx* Oosthuizen, Hussein & El-Shimy, 1988**	***A. disuqi* El-Shimy, 1990**	***A. levis* Gouda, 2010**
Shape and size	oval to pear-shaped, broadly oval at rest, up to 10 mm long, up to 5 mm wide	elongated oval at rest, up to 16 mm long, up to 6 mm wide	oval to oblong when at rest, up to 13 mm long, up to 5 mm (?) wide	elongate-oval at rest, widest behind the middle, 7 mm long, 2.5 mm wide, dorsally convex, ventrally flat	elongate-oval, up to 8mm long, up to 3mm wide
Head region	bluntly rounded	bluntly rounded	slightly pointed	not deposed, no narrowing of the neck	discontinued
Basic color of living animals	orange-amber, rarely yellowish to white-grey	blue, green, turquoise, beige, brownish, yellowish, head and sides transparent	light brown with dark brown chromatophores	snow-white, slightly transparent	greenish
Mottle/pattern	no	no	irregular dark brown longitudinal stripes	dark brown pigments on the tubercles of the central crest (on a2), irregularly also on other warts on a2	irregularly arranged pattern of dark green chromatophores
Papillae and tubercles	finely granulated by faint even papillae	smooth or small regularly arranged sensory papillae	12–19 large papillae per annulus, irregularly arranged, many small papillae	Approx. 20 warts of unequal size per annulus, median row of warts like a crest, small papillae	smooth, without papillae except minute papillae in cranial sucker
Eyes	6, 1st pair mostly separate, 2nd and 3rd often fused, also absent	6, 1st pair mostly fused, 2nd and 3rd often fused, also missing	6, 1st pair fused, 2nd and 3rd pair with large space between and fused	6, 1st pair mostly fused, 2nd and 3rd often fused, also missing	6, 1st pair mostly fused, 2nd and 3rd often fused, various eye positions
Cranial sucker	large, broad, bowl-shaped	pointed transversely oval, evenly curved in front, mostly with a blunt edge behind, filled in	Narrow transverse oval, evenly arched in front and behind, bowl-shaped	bowl-shaped with a thickened edge	cup-shaped, with a thickened rim
Mouth	small, in the center of cranial sucker	small, slightly above center of cranial sucker	small, in the center of cranial sucker	subapical position	small, in the center of cranial sucker
Caudal sucker	large, ± circular, > than half the maximum body width	small, ± circular, < half the maximum body width	small, ± circular, < half the maximum body width	small, ± orbicular (?), < half maximum body width, narrow crescent-shaped margin visible dorsally	small, circular, < 1/3 of maximum body width
Pairs of crop caeca	6, ± evenly curved, only the posterior branched	7, angled, all branched	7, all branched	6	7, bilobed
Gonopores	1	2, separated by 2 annuli	2, separated by 2 annuli	1	2, separated by 2 annuli
Eggs/juveniles	30–60	200–400	30–50	?	13–25
Food	Gastropoda	Gastropoda	Gastropoda (possibly only *Bulinus truncatus*)	Gastropoda (*Gyraulus costulatus*, *Biomphalaria alexandrina*, evtl. *Theodoxus niloticus*)	Gastropoda (all species offered), oligochaetes (esp. Tubifex)
Biotope	rivers, lakes, ponds	sources and streams in the colline and montane regions	streams, rivers and canals, on stones, never on plants	stream and channels, under stones and at the base of water lilies (*Eichhornia crassipes*)	shallow, muddy, polluted calm water
Distribution	Western, Central and Eastern Europe, Balkans, Italy, not on the Iberian Peninsula, to Central Asia, Northwest Africa	Southern Iberian Peninsula, Morocco (Atlas Mountains)	Egypt (Nile between Luxor and Delta), Ethiopia (?)	Egypt (Nile and irrigation canals in the Nile Delta)	Egypt (Al Sont Canal in Asyut)

Table 6. Characteristics of African *Alboglossiphonia* species (south of the Sahara), Afrotropis. Based on Gouda (2010) with additions from Moore (1939), Oosthuizen (1978 a, b, 1991), Augener (1936).

	A. afroalpina **sp. nov., Jueg**	***A. buniana*** **sp. nov., Jueg**	***A. disjuncta*** **(Moore, 1939) [incl.** ***Glossiphonia verrucata*** **Sciacchitano, 1939]**	***A. macrorhyncha*** **(Oosthuizen, 1978)**	***A. conjugata*** **(Oosthuizen, 1978)**	***A. namaquaensis*** **(Augener, 1936) [incl.** ***A. cheili*** **(Oosthuizen, 1978)]**
Shape and size	elongated, moderately curved dorsally, flat ventrally, 6.0 mm long, 1.6 mm wide, posterior edge strongly concave dorsally (part of the caudal sucker is exposed)	elongated-oval, dorsally moderately convex, ventrally flat, up to 7.1 mm long, up to 3.1 mm wide, tapering towards the front end, with head lobes, lateral edges wavy to very jagged	elongate-oval, first third narrow, 11.6 mm long, 2.2 mm wide, sexual maturity already at a small size, slightly convex, flat underside	pointed-oval, tapering towards the front end, flattened, up to 9.8 mm long, up to 4.2 mm wide	elongate-oval, moderately flattened, ventrally flat, 9.1 mm long, 2.8 mm wide, sexually mature even at a small size	elongate oval, moderately flattened, dorsally convex, ventrally flat to bell-shaped, up to 12.5 × 2.8 mm
Head region	distinct, short and wide	not clearly set off, tapered in front	clearly set off over neck constriction	not deposed or widened	clearly separated, only slightly broadened	short, clearly set off by a nuchal furrow
Basic color of living animals	probably light brown to beige	probably light brown to yellowish	flesh-colored or green	brown	green or brown, or shades thereof	brown or green
Mottle/ pattern	circular spots (only slightly darker than ground colour) on each annulus, giving a diffuse pattern on the dorsal side, suggesting (probably coincidentally) longitudinal rows which may be interrupted or of different lengths, higher concentration of circular spots on the sides of the body, fewer ventrally stain	30–36 narrow dark vertical stripes, no spots or patterns	dorsally with about 36 longitudinal stripes at the widest part of the body or chromatophores irregularly distributed	more than 10 pairs of dark brown narrow longitudinal stripes, light median field, isolated pigments outside the stripes	34–36 dark longitudinal stripes at the widest part of the body; Chromatophores evenly distributed dorsally except for head region, lateral margins and posterior sucker, sometimes forming transverse streaks, paler unicolor ventrally	dorsally with 30 dark brown or dark green narrow discontinuous stripes, fainter towards the ends, apex, postnatal ring and lateral margins unpigmented
Papillae and tubercles	smooth, no warts or papillae, very small, barely visible, low sensory papillae in transverse rows on each annulus	smooth, no warts or papillae, very small, barely visible, low sensory papillae, especially numerous on the margins of the lateral lobes	18 distinct papillae in transverse rows on each annulus in midbody region; larger papillae arranged in 7 longitudinal rows, many very sensory papillae unevenly distributed	roughened by clear papillae (largest on a2) on the dark longitudinal stripes	3 pairs of longitudinal rows of papillae on both sides, 16 large papillae on each annulus, numerous small rounded papillae, ventrally fewer small papillae	no prominent papillae, very small, low dome-shaped sensory papillae evenly distributed over body, eye area and posterior suction cup with irregular papillae
Eyes	6, 1st pair on a4, 2nd and 3rd pair on a5, eyes of 2nd and 3rd pair larger, occasionally fused, great variability in arrangement	6, 1st pair (fused) on a4, 2nd and 3rd pair (left and right fused) on a5, only 3 eyes visible	6, 1st pair on a4, 2nd and 3rd pair most fused or close, both on a5	6, 1st pair of smaller ones, anterior and both lateral pairs often fused, variable	6, 1st pair on a4, 2nd and 3rd pair on a5, eyes of 2nd and 3rd pair much larger, occasionally fused	6, small, 1st pair in a4, 2nd and 3rd in a5, pairs of eyes close, sometimes fused, variable
Cranial sucker	large, cupped, with strong edges	small, flat, pear-shaped, rounded in posterior part, grooved in front, thin-walled	small, shovel-shaped	flat	cupped with deep cavity, well-developed rim with numerous tiny papillae	roundish-oval, moderately deep, bowl-shaped with thin side walls, edge covered with small papillae; 0.6 × 0.7mm
Mouth	in the center, mostly large, triangular, sides slightly concave, base slightly convex	in the center, stitch-like small	relatively large in the center	in the center, with a striking transverse slit	big in the center	large, on top of a large dome-shaped papilla, in the center
Caudal sucker	small, circular, < half of maximum body width, slightly cupped, deepened in the middle, with a broad margin (ring-shaped)	small, circular, < third of maximum body width, flat, broad base, with thick wall	small, circular, diameter 0.9 mm, < half of maximum body width	small, circular, < half maximum body width, flat cup-shaped, distinct from body, dorsally with 7–8 brown bands	small, circular, < half maximum body width, deeply cupped with thin margin, broadly attached	small, circular-elongated oval, 1.1 × 1.0 mm; moderately thick walls; Posterior edge barely visible from dorsal
Pairs of crop caeca	?	6, first 5 pairs slightly divided, 6th pair each with 5 small side lobes	7, the first 6 unlobed, 7th pair each with 4 small side lobes	6, first 5 pairs unlobed, 6th pair with 4 side lobes each	7, bilobed, postcaeca with 5–6 lateral lobes	7, the first 6 bilobed, postcaeca each with 15 slender lateral secondary lobes
Gonopores	2, separated by 2 annuli, very small and inconspicuous, areas visible only as narrow dark streaks in the sulci between the annuli	2, separated by 2 annuli, very small and inconspicuous	2, separated by 2 annuli (XI/XII and XIIa2/ a3), male well visible, female not	2, separated by 2 annuli, both small	2, separated by 1 annulus, walls at male and female atria	2, separated by 2 annuli, very small, poorly recognizable
Eggs/ juveniles	clutch with at least 20 eggs	?	?	?	?	clutch with at least 30 eggs
Food	probably small mussels (*Pisidium montigenum*) and insect larvae (Chironomidae)	Gastropoda (*Biomphalaria pfeifferi* and *Radix natalensis*)	Gastropoda (*Bulinus truncatus*), insect larvae	Gastropoda	Gastropoda	Gastropoda (*Bulinus truncatus*), insect larvae

	A. afroalpina **sp. nov., Jueg**	*A. buniana* **sp. nov., Jueg**	*A. disjuncta* **(Moore, 1939) [incl.** *Glossiphonia verrucata* **Sciacchitano, 1939]**	*A. macrorhyncha* **(Oosthuizen, 1978)**	*A. conjugata* **(Oosthuizen, 1978)**	*A. namaquaensis* **(Augener, 1936) [incl.** *A. cheili* **(Oosthuizen, 1978)]**
Biotope	mountain lakes in the Afroalpine zone (3,000 to 4,500 m above sea level)	?	permanent and semi-permanent bodies of water: rivers, lakes, reservoirs with muddy water, under stones	reservoirs, on riparian vegetation	springs with permanent water, rainwater pools, reservoirs with muddy water, under tree stumps	rivers (also ephemeral), rainwater basins, ponds, reservoirs, under stones
Distribution	Kenya (Mt. Kenya Massif and Mt. Elgon Massif)	Democratic Republic of Congo, Bunia (Province of Ituri)	Uganda, Ethiopia, Togo, Democratic Republic of Congo, Namibia, South Africa	Coastal region of South Africa between Mozambique and Lesotho	Namibia, South Africa	Namibia, South Africa, Democratic Republic of Congo, Kenya

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